

Pit and Quarry

SAND - GRAVEL - STONE
CEMENT - LIME - GYPSUM

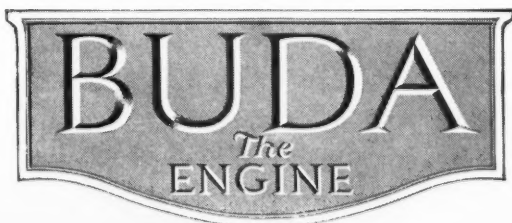
Rugged Power

The sturdiest and most reliable power obtainable from gasoline — that's the record of Buda engines in hard service. The 87 H. P. Model JH engine is a giant in strength and stamina, designed and built for continuous heavy duty year after year.

Forty-five years of good manufacturing has convincingly shown final cost to be more important than first cost — Buda stays on the job with low maintenance.

THE BUDA COMPANY
HARVEY CHICAGO SUBURB ILLINOIS

Buy only genuine Buda Parts for your Buda engine



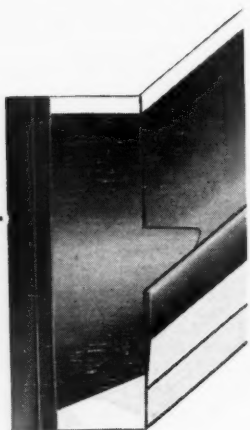
February 15, 1926

Index to Advertisers ----- Page 47

Table of Contents ----- Page 49

Circulation 7,500

Renewable Manganese Feed Spout End



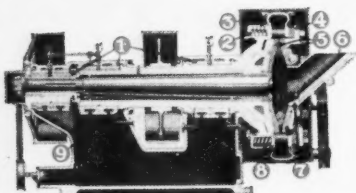
— this new improvement —

—is but another example of the result of Symons Brothers Co. engineering development to not only increase the working efficiency of disc crushers —but to provide improvements that will greatly reduce maintenance and up-keep cost and permit the replacement of certain sections that may wear out faster than others

can easily and quickly be installed on any style disc crusher now in use

(Ask for engineering consultation)

NEW FEATURES



SYMONS DISC CRUSHER

1. Choice of Bronze or Babbitt Bearings.
2. Springs guarantee against breakage from non-crushable material.
3. One-piece head liners and segment sides proportioned for minimum waste of metal.
4. Adjustment Shims for taking up wear and changing size of product.
5. Inner and Outer Discs interchangeable. Less waste.
6. Reversible bottom.
7. Manganese Feed Spout renewable end.
8. Renewable angle wearing ring.
9. Spring oil wipers—no oil leakage.

All above parts standard except springs on head which will be furnished when desired at reasonable additional cost.

SYMONS BROTHERS CO. ORE, ROCK AND GRAVEL CRUSHERS

RAILWAY EXCHANGE BUILDING MILWAUKEE, WIS.
LOS ANGELES OFFICE NEW YORK OFFICE
SAN FRANCISCO OFFICE PHILADELPHIA OFFICE
HOLLYWOOD



DIGS HARDER MATERIALS— the full power of the independent hoisting, crowding and swinging engines can be used at the same time when needed.

DIRECT-CONNECTED AIR ENGINES that work only when the shovel is swinging or crowding.

3-LEVER CONTROL— Digging action is fast and smooth.

From Oklahoma—Michigan—Oregon— Pennsylvania—California

From all over the country— reports keep coming in telling of the splendid service given by Gas+Air ERIES.

The more shovel owners use these machines, the better they like them. Just got a letter from W. M. McMichael, of Tulsa, Okla. He writes:

“Want to tell you how well pleased we are with the Gas+Air ERIE. It has come up to every expectation and we feel qualified to say it’s the best gas machine on the market.

“This shovel is turning out an average of 796 yards a day, and we find that the low cost of operation is another valuable point.”— W. M. McMichael, Tulsa, Oklahoma. (3 ERIES).

Other Gas+Air ERIES are giving the same good results

Mr. McMichael tells the same story that has been told by others— North and South, East and West.

The Gas+Air ERIE is a gasoline shovel— but has no reversing frictions on hoisting, crowding or swinging.

Instead, direct-connected air engines for crowding and swinging give the Gas+Air ERIE the simplicity and reliability needed to do steady work.

See the Gas+Air ERIE at work— size it up by *performance*. You can count on the same good results that other owners are getting.

ERIE STEAM SHOVEL CO., ERIE, PA., U. S. A.

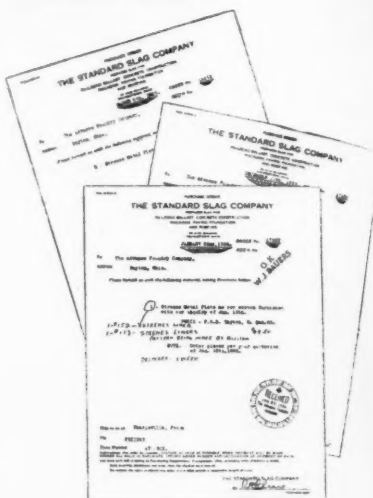
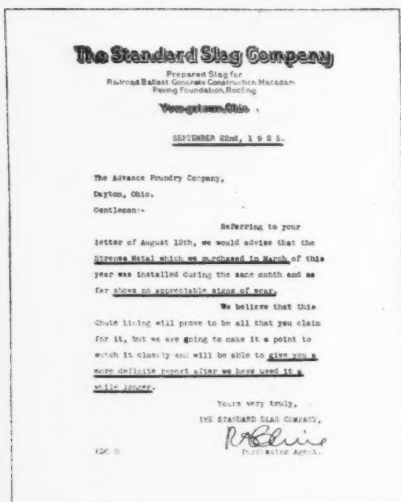
Builders of ERIE Shovels, Cranes, Ditchers, Draglines, Trench Hoers, etc.

Branch Offices: Boston, New York, Philadelphia, Pittsburgh, Atlanta, Chicago
Representatives throughout the U. S. A.

ERIE GAS+AIR Shovel and Crane

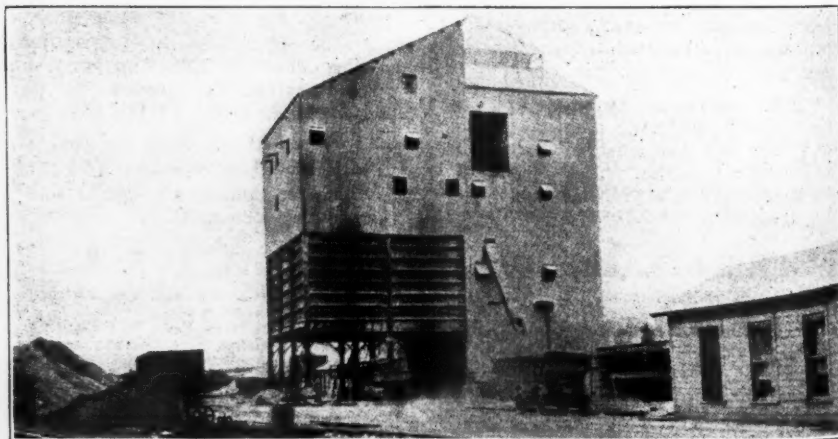
Fully protected by basic patents

HERE IS PROOF



The worth of any material is not proven by sales made by the manufacturer but is proven through repeat orders from thoroughly satisfied users.

ON THE DAY YOU INSTALL
STRENES CHUTES OR LININGS
 YOUR CHUTE TROUBLES STOP AND YOUR SAVINGS
 START
 FOR FURTHER EVIDENCE WRITE FOR BULLETIN 26-P



THE ADVANCE FOUNDRY CO., Dayton, O.

KOEHRING

Crane Excavator



Far Greater Clutch Frictional Area!

THAT'S why the Koehring has *Finger-tip control* at the levers!

Levers work easy because the far greater contact surfaces of the double outside band, equalizing friction *clutch* makes the levers work easy!

So, you have *Finger-tip control* without mechanical complications to help shift levers which ought not to be hard shifting in the first place. The Koehring operator does not lose the "*feel*" of the bucket—an important factor in accuracy of operation!

Crane Capacities

No. 1—1½ cu. yd. clamshell bucket on 40 ft. boom or ¾ cu. yd. on 45 ft. boom. Lifting capacity, 10 tons at 12 ft. radius, 4 cylinder, 5x6 in. gasoline engine, 1,100 R.P.M.

No. 2—1¼ cu. yd. clamshell bucket on 45 ft. boom or 1 cu. yd. on 50 ft. boom. Lifting capacity, 15 tons at 12 ft. radius, 4 cylinders, 6x7 in. gasoline engine, 925 R.P.M.



Write for Crane Bulletin No. Cr-32.

KOEHRING COMPANY

PAVERS, MIXERS—GASOLINE SHOVELS,
CRANES AND DRAGLINES

MILWAUKEE, WISCONSIN

Sales Offices and Service Warehouses in principal cities
Foreign Dept., Room 1370, 50 Church St., N. Y.
Canada, Koehring Company of Canada, Ltd.,
105 Front St., East, Toronto, Ontario.
Mexico, F. S. Lapum, Cinco de Mayo 21,
Mexico, D. F.

A2688

A sure way to cut haulage costs!

Side by side with more expensive locomotives, Brookville Gasoline Locomotives are showing definite and substantial savings in haulage costs in quarry, sand pit, road construction and industrial service.

Being built around Fordson tractor and ton truck power units insures both a lower first cost and lower operation cost and maintenance—and every Ford dealer is a service station.

Write today for additional details and prices.

*Or
Ask
These
They
Know*

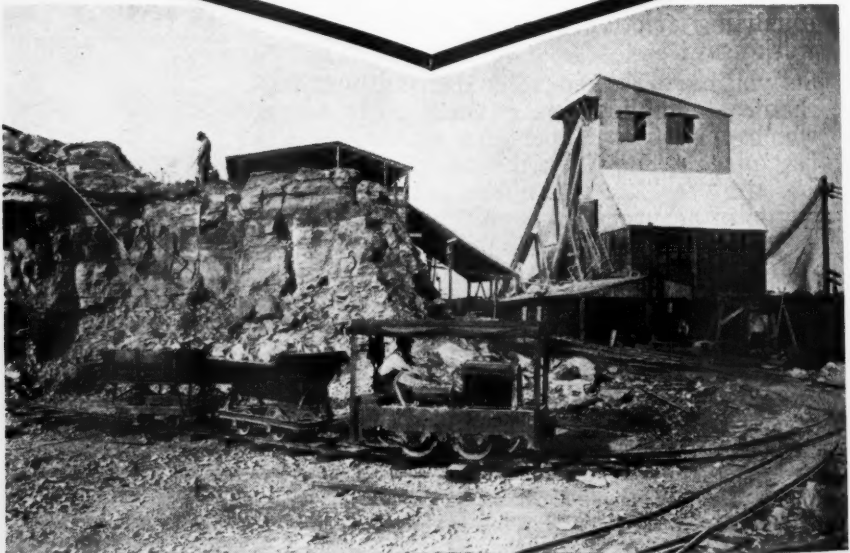
These can speak from experience: Long Blue Granite Quarries, Inc., Elberton, Ga. Richwood Gravel & Stone Co., Richwood, Ohio. Vulcanite Portland Cement Co., Easton, Pa. Wyandot Clay Products Co., Upper Sandusky, Ohio.

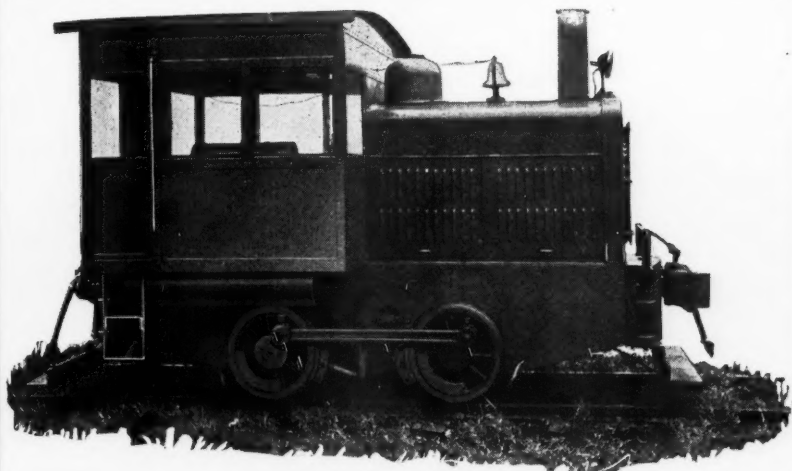
Illustration is that of a Brookville locomotive in the plant of the Thompson Bros. Rock Co., Kansas City, Mo.

Write today for additional details and prices

BROOKVILLE TRUCK & TRACTOR CO.
BROOKVILLE PA.

BROOKVILLE
GASOLINE LOCOMOTIVES





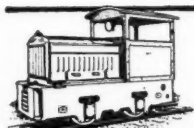
A Type for Every Service

Small sizes for light haulage—medium sizes for average pit work—and large sizes for switching and heavy pit work.

"Whitcombs" are made in all sizes from $2\frac{1}{2}$ to 25 tons and in any gauge. Each size is amply powered with from 10 to 16 horse-power per ton of weight—the required horse-power for really efficient hauling.

When you need a locomotive ask a Whitcomb user about his "Whitcomb"—then write our nearest office for complete information on the size and type best suited to your work.

Shall we send you advance data?



**"WHITCOMBS"
HAVE MORE
HORSE POWER
PER TON**

Geo. D. Whitcomb Company

Rochelle

Illinois

Offices in principal cities

GASOLINE - STORAGE - BATTERY - ELECTRIC

WHITCOMB
LOCOMOTIVES



MASSILLON

The Popular Shovel

EVERYBODY likes a man or a machine possessed of unlimited power and vim. That's the Massillon, full of rip-roaring capacity for work, and the ability to tear through it all whether it be hard or easy. Ask those who use it and **know**.

Send today for literature

THE RUSSELL & CO.

B U I L D E R S

MASSILLON, OHIO

The **MODERN**  **MASSILLON**
 Steam — **3/4 - 7/8 RANGE** — Shovel



MAKERS OF POWDERS SINCE 1802



The oldest du Pont
powder mill—
built in 1802

Leadership

Leadership is measured by service. For nearly a century and a quarter, the du Pont name has signified leadership in explosives manufacture on this continent.

Paralleling the rapid growth of American industry, du Pont has developed explosives to meet new needs and solve new problems that industry might be served.

Thus has it been the privilege of du Pont to contribute a share in the industrial expansion of the Republic.

E. I. DU PONT DENEMOURS & CO., Inc.
Explosives Department
WILMINGTON, DELAWARE

Partial view of Rep. 3100
Plant, one of the largest
explosives plants of the
du Pont Company.

123 YEARS OF LEADERSHIP IN THE SERVICE OF INDUSTRY

A truck such as men



General Motors Contribution to American Industry

BORN of the combined engineering genius of 1,000 of the world's foremost engineers and fostered by the gigantic General Motors Corporation, with operations covering some 144 countries, resources running in the hundreds of millions of dollars and sales aggregating One Billion Dollars yearly, comes Big Brute—a truck such as the industrial world has never seen before.

GMC Big Brute

have never seen before



BRUTE in name, power, in size. Brute in terrific stamina and tremendous endurance. Big Brute is built to stand impregnable against the most brutal requirements of man and industry.

Beautiful in its brutal ugliness, Big Brute looks what it is . . . a *Colossus among the Giants of modern transportation*. With the operating ease of a lithe passenger vehicle: a Fisher-Built Cab to furnish driver's comfort unknown before, and mechanical improvements years beyond the ordinary conception of today, it stands to change the industrial motor transportation of the world.

A Truck Without "Bugs"

From its vast engineering experience, covering the production of over 4,849,485 passenger and commercial cars, during the last 25 years, General Motors Corporation has eliminated, in Big Brute, the vital weaknesses, the engineering mistakes, the structural flaws previously common among heavy duty trucks. **Big Brute is a truck without "bugs."** More than 71% of all motor vehicles made and sold by General Motors are now in active service.

The motor trucks of the entire world were studied by General

Motors engineers in developing Big Brute. It was learned why some trucks rendered but limited service. Why others surpassed them. Why some operated under nominal upkeep, while others were economic failures. One by one, these factors were met, analyzed and weighed. All mistakes of past years were corrected. *A new standard in heavy transportation thus was set.*

Sold Under GMAC Plan

Big Brute, like all other products of the General Motors Corporation, is offered under the liberal General Motors Acceptance Corporation Plan of deferred payments—the lowest cost under which any motor car or truck can be financed on time payments.

GENERAL MOTORS TRUCK
COMPANY
PONTIAC, MICH.

Products of

Yellow Truck and Coach Manufacturing Company

subsidiary of General Motors

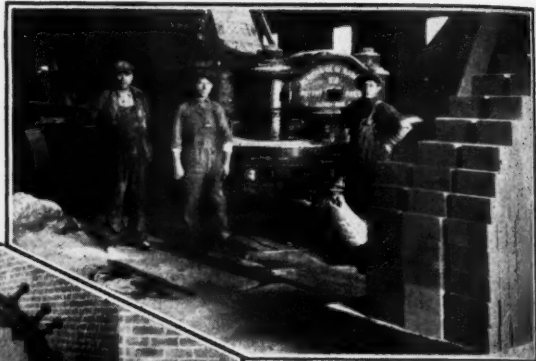
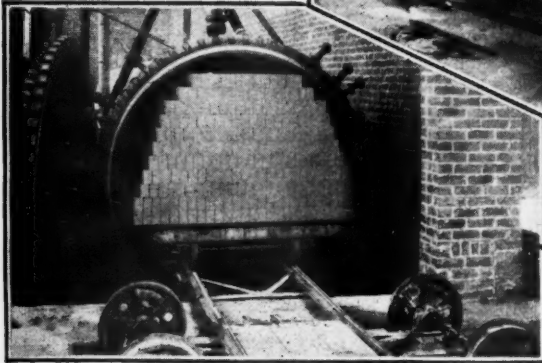
GMC Big Brute, 3½ and 5 ton trucks
GMC 1, 1½ and 2½ ton trucks
Yellow Cabs Yellow Coaches
Yellow Light Delivery Trucks
Hertz Driverself Cars
GMC 5 to 15 ton Tractors



GMC Big Brute

Bricks Made Today— Used Tomorrow

Hardening Cylinder



The Press

Quick turnover is characteristic of Sand-Lime Brick business.

Brick made today can be used tomorrow.

Most brick requires weeks in making.

Sand-Lime brick are made with meager equipment compared to other building products.

Press, grinding pan and hardening cylinder are the bulk of equipment required.

Sand and Lime are the only materials needed.

Sand-Lime brick are in big demand. Smooth, dense, durable—really an artificial stone in brick size.

Write for particulars and Bulletin of equipment

The Hadfield-Penfield Steel Company
BUCYRUS, OHIO

Linn Waukesha Motored Snow Plow Tractor



Plowing Thru Seas of Snow

North of "Thirty Eight" highway officials must keep their highways open in spite of snow. Plowing thru seas of snow with the mercury below zero is not for makeshift equipment or "hot house" men. "He men" and "Brute" equipment are needed. Fleets of Linn Tractor Plows are being used in most of the snow fighting states this winter. Waukesha heavy duty type motors provide the high power and reliability required, as well as ease of operation in coldest weather.

No more severe motor conditions are encountered in crowding a power shovel than in bucking snow drifts, nor more responsiveness needed in maneuvering a boom than guiding one of these shovels. Write for "Heavy Duty" Motor Bulletins describing Power Shovel Type motors with Waukesha "Ricardo Head."

WAUKESHA MOTOR COMPANY

Waukesha Wisconsin

New York Kansas City Denver Tulsa Houston
Aolian Building V. L. Phillips Co. Wilson Machy. Co. C. F. Camp Co. Portable Rotary Rig Co.

Exclusive Builders of Heavy Duty Gasoline Engines for Nearly Twenty Years



The One Feature

you should know all about

Five years is a long while for the transmission and drive unit of any locomotive working to capacity every day to perform without giving trouble. Yet, this is the record of every Vulcan Work-Gear-Drive Gasoline Locomotive put in operation since we started to build this type five years ago.



Vulcan Products

Hoists,
Electric and Steam
Locomotives,
Steam, Gasoline, Electric
Rotary Kilns, Dryers, Coolers and
Roasters
Fairebild Double-Discharge
Ball Mill
Mine Ventilating Fans
Cages and Skips
Sheave Wheels
Corliss Engines
Coal Crushers
Gray Iron Castings
Open Hearth Steel Castings
Gears, Moulded and Cut Teeth
Special Machinery

Not a Single Breakdown

And, the reason for this unusual service is the Vulcan designed and built Worm-Gear-Drive.

Its long life and lack of trouble is found in the fact that there are no chains or sprockets to wear out,—not a single weak part in the whole drive unit.

You want the full details on this locomotive, particularly on its drive unit. Just send for Vulcan's Gasoline Locomotive Bulletin today.

VULCAN IRON WORKS
OF
Wilkes-Barre, Pa. U.S.A.
STEAM
GASOLINE
ELECTRIC **LOCOMOTIVES**

EASTON QUARRY CARS



TRACK GAUGE

We recommend quarrymen to adopt two track gauges as standard, namely, 36 in. and 4 ft. 8½ in.

On the smaller they can operate as small a car as is desirable or use cars up to 5 or 6 cubic yards shovel loaded.

Standard Gauge track will handle shovel loaded cars of any capacity, preferably over 4 cubic yards.

These two gauges give all the selection that is desired in types of cars and the choice of stock locomotives.

EASTON CAR & CONSTRUCTION CO.

Kansas City, Mo., and Easton, Pa.

New York

Chicago

Pittsburgh

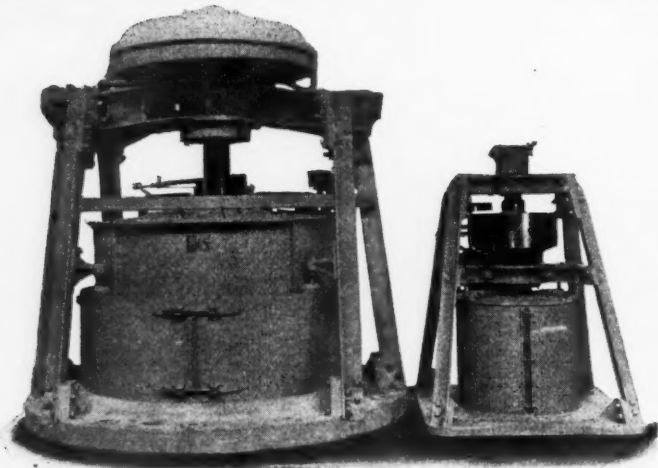
Philadelphia

San Francisco

EASTON CARS

FOR EVERY PIT MINE & QUARRY

PULVERIZERS



Bradley Hercules Mill

No. 24 Griffin Mill

Pulverizing Machinery For Most Every Purpose—

For Cement Plants—Fertilizer Plants—
Agricultural Limestone Plants, Etc.—Etc.

Reducing

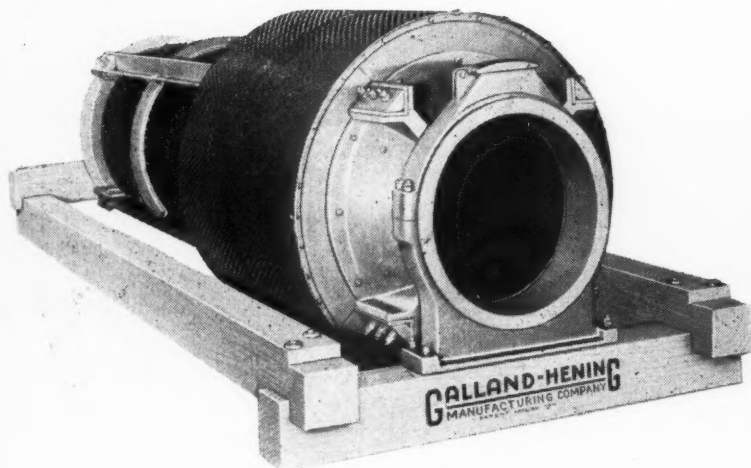
Cement Clinker—Cement Rock—Limestone—
Phosphate Rock—Agricultural Limestone—Rock
Dust for Mines—Gypsum—Etc., Etc.

Out Puts—1-40 Tons per Hour
Fineness—20-200 Mesh

BRADLEY PULVERIZER COMPANY

BOSTON Works: ALLENTOWN, PA. LONDON

LOOKING INTO THE FEED END



ROLLERLESS ROTARY SCREEN

Note Absence of Rollers and Riding Rings

The entire lower half of supporting casting bolted to timbers constitutes the liberal dimensioned bearing with removable babbitt shell.

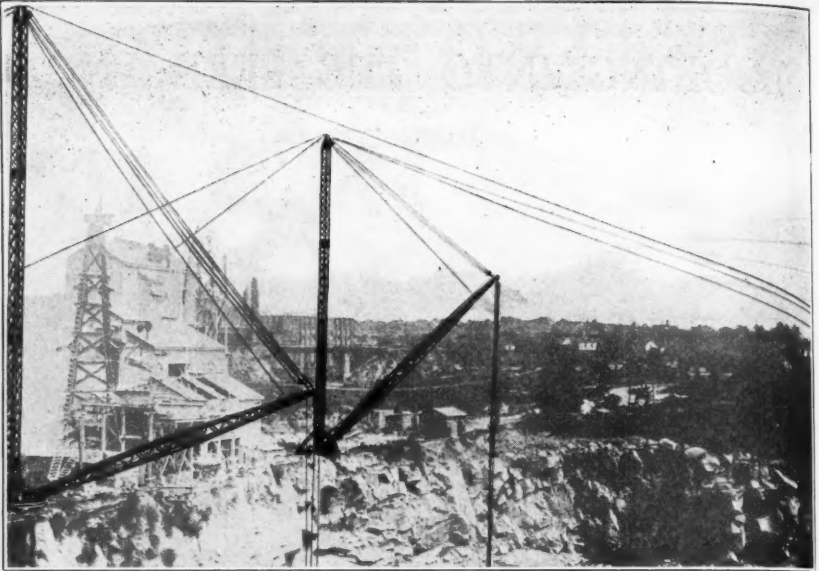
Hinged cover on top casting is the only lubricating point on this end—entire upper half forming a grease chamber.

Only Two Points to Lubricate on Screen Proper

NO DESTRUCTIVE VIBRATION
THE ROLLERLESS IS SELF ALIGNING

GALLAND-HENNING
MANUFACTURING COMPANY
MILWAUKEE — U. S. A.

VIBRATORY SCREENS—ELEVATORS—BIN GATES—PERFORATED METALS—COMPLETE SAND, GRAVEL & STONE PLANTS
DESIGNED & EQUIPPED



**The Palmetto Quarries of Columbia,
S. C. Say Their "AMERICAN" Steel
Derricks "Have Been Very
Satisfactory"**

For nearly 6 years two "AMERICAN" Steel Guy Derricks have been in use at the large granite quarry of the Palmetto Quarries Co. at Columbia, S. C. These two derricks, operated with "AMERICAN" Hoisting Engines load all stone taken from the quarry. They have made lifts of as great as 22 tons.

"AMERICAN" Derricks are built in a wide range of styles and capacities. There is one suited to every lifting problem. Write for catalog showing the full line and let us prescribe the right equipment to end your material handling worries.



AMERICAN
HOIST & DERRICK CO.



Saint Paul, Minn.

New York, Chicago, Pittsburgh, Seattle, New Orleans

Keep production costs down in 1926

P & H machines have demonstrated their value in keeping down costs of production. They are economical—stay on the job—require but little maintenance work.

Get a P & H now—keep accurate records—and you too will see that the care in selection of materials, the use of high grade steels, the cutting of gear teeth, the grinding of shafts, and the thorough workmanship are well worth while in dollars and cents. Send for Bulletin 60-X—no obligation.

HARNISCHFEGER CORPORATION

Successor to

PAWLING & HARNISCHFEGER CO.

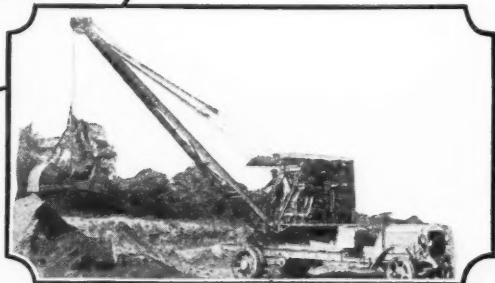
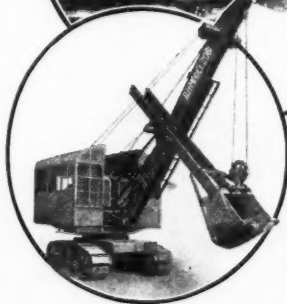
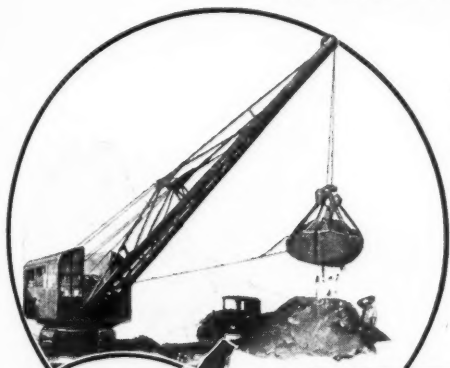
Established in 1884

3851 National Ave.,
Milwaukee, Wis.

New York	Los Angeles
Jacksonville	Dallas
San Francisco	Pittsburgh
Minneapolis	Detroit
Philadelphia	Charlotte
Memphis	Indianapolis
Birmingham	Portland
Kansas City	Seattle
Chicago	

*Warehouses and Service
Stations:*

Philadelphia	Los Angeles
Memphis	Jacksonville
San Francisco	Seattle



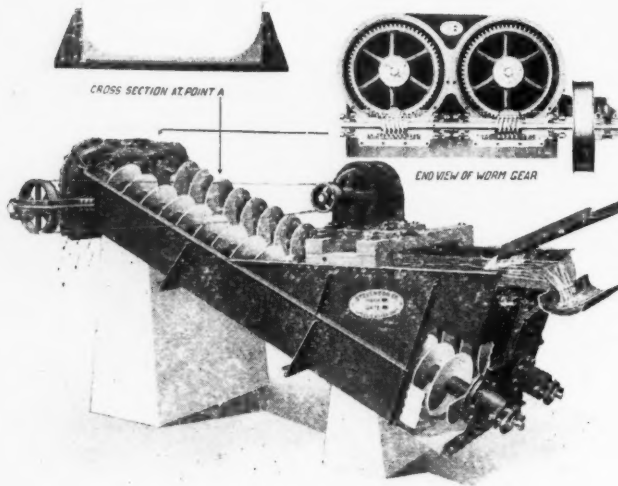
P & H Excavators are convertible into shovels, clamshell cranes, draglines, pile drivers.

The new P & H Truck and Trailer Cranes are described in Pamphlet 635-X. Send for copy.



CRANES and EXCAVATORS

THE STEVECO



SAND AND GRAVEL WASHER

Steveco Washers are available with water feed as shown or with a series of bottom connections using pressure feed.

Steveco Washers are founded on our 60 years experience in serving the non-metallic mineral industry.

Communicate with us

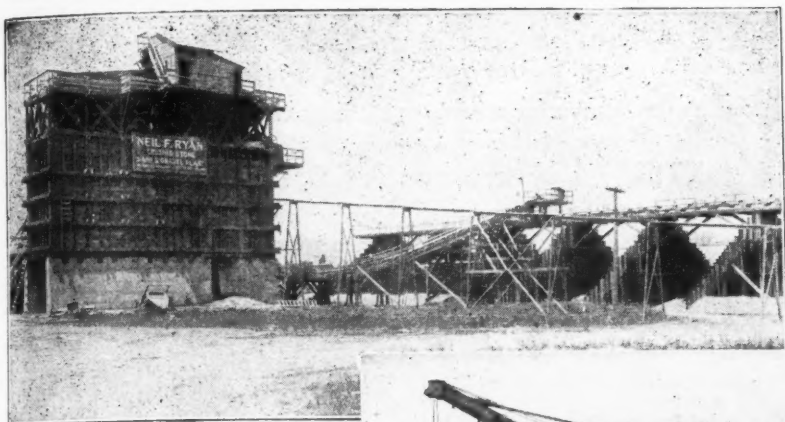
THE STEVENSON COMPANY
Wellsville, Ohio



M

A
effici
at t
ston
Sche
Cran
equi

TH
Cleve
Chica



Mobility—
Speed—



Greater Capacity

A cost-reducing feature of the efficient material handling system at the Neil F. Ryan's crushed stone, sand and gravel plant at Schenectady, N. Y., is a Universal Crane mounted on a motor truck, equipped with a $\frac{1}{2}$ -yd. bucket.

The great capacity, mobility and speed of the Universal Crane **reduces costs.** Its motor-truck mounting transfers it quickly from one job to another. Its rapid swing gives it quick handling capacity; it costs less to operate than larger machines.

The Universal is adaptable to wide service,—to moving material from pit or quarry to trucks; from trucks to storage; storage to trucks; storage to cars; storage to storage; or yard to yard.

Write us today for descriptive Bulletin 281-A

THE UNIVERSAL CRANE CO., Cleveland, Ohio

Cleveland: 938 Sweetland Bldg.
Chicago: 672 Transportation Bldg.

New York: 90 Wall St.
Boston: 6 Beacon St.



THE INSLEY EXCAVATOR

Built to Do the Work Which a Large Shovel Cannot Do—PROFITABLY

Low Cost Excavation

IT is a well-known fact that the cheapest excavation is done by the largest machine, provided the large machine is operated to capacity. As its production falls off, unit costs increase rapidly, until a point is quickly reached where the expense of operating the large excavator offsets the saving it effects, and the work is done at a high cost if not an actual loss. The problem, then, is how to handle a light daily yardage economically when a light yardage is frequently required.

The answer to this problem is the **INSLEY EXCAVATOR**. It is a light and sturdy machine especially designed and built for just such work as stripping, clay mining, gravel pit work and material reclaiming of all kinds, where a daily yardage of from 300 to 450 cubic yards is sufficient. It will handle light work with exactly the same efficiency and economy as a larger excavator will handle 1,000 yards a day.



INSLEY

CONCRETE PLACING EQUIPMENT

STEEL DERRICKS

BUCKETS AND CARS

EXCAVATING EQUIPMENT

THE INSLEY EXCAVATOR is mounted on extra wide full-crawlers, and the weight is so distributed that the machine exerts a uniform bearing pressure of only 8 pounds per square inch on the soil. It has ample power both for digging and traveling, and will get itself over any sort of soil, and do any kind of digging. It is strictly a one-man machine, its fuel consumption is low, and, best of all, its first cost is low. All these factors go together to make the Insley Excavator an exceptional value for light work, which is worthy of your consideration.



INSLEY MANUFACTURING CO.

Engineers and Manufacturers
INDIANAPOLIS



Quarry Hoists and Derricks CLYDE STEAM-ELECTRIC



A year ago the above illustrated CLYDE installation was made at the sand and gravel pit of A. Beatrice & Sons, Boston.

The CLYDE equipment installed consists of the steel derrick, steam hoist and a separate swinging engine.

The production of this pit is 250 yards daily and the operators express the greatest enthusiasm concerning the performance of the CLYDE installation.

Detailed information upon request given cheerfully by the home office or any Clyde branch.

You'll take Pride in your Clyde!

CLYDE IRON WORKS SALES COMPANY

Sole Distributors for CLYDE IRON WORKS, Duluth, Minn.

Stocks Carried in the Following Warehouses:

NEW ORLEANS
309 Magazine St.

NEW YORK CITY
E. 136 St. and Locust Ave.

PORTLAND, ORE.
555 Thurman St.

SEATTLE
3410 First Ave. So.

Branch Offices:

CHICAGO
11 So. La Salle St.

CINCINNATI

MEMPHIS

JACKSONVILLE, FLA.

SAN FRANCISCO
737 Monadnock Bldg.

1913 Union Central Bldg. 69 Union Ave. 43-45 W. Forsyth St.

THE CRUSHERS

with the
Troubles Left Out

WHY THEY LEAD

- 1—They are noiseless and run like watches.
- 2—50% greater capacity for same power.
- 3—Practically no wear on anything but head and concaves.
- 4—Short shaft and saving in head room with packed dust collars.
- 5—Shaft reinforced with self-locking head so that it cannot break where 90% of shafts have broken.
- 6—Can be driven right, left, or standard, as sent from shop.
- 7—Eccentric is turned by flexible coupling attached to pulley, which prevents side thrust and heating, as in geared crushers.
- 8—Ball and socket eccentric, self-aligning, eliminating friction and heating. Runs for years without attention.
- 9—Positive circulating oil system through filter and cut geared oil pump.
- 10—Made in our own shop by experts, trained for the job.
- 11—It is a crusher with the trouble left out. See it in operation, and you are unfit to listen to any geared crusher salesman. In fact, if you are near one of his machines, you can't hear him, if you are so inclined.
- 12—Our fine crusher does the work of 4 geared crushers.

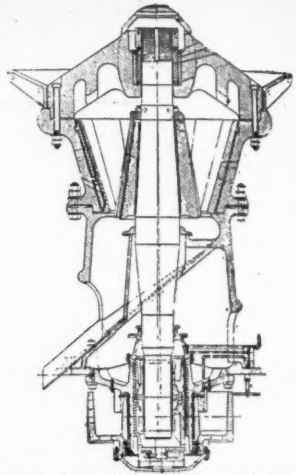
Send for catalogue and tell us what your problems are, and one of our experts will call on you without obligation on your part.

KENNEDY VAN SAUN MFG. & ENGR. CORP.

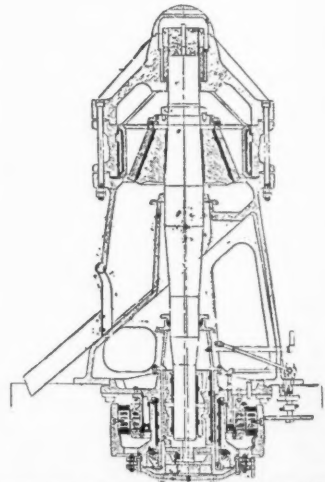
50 Church St. NEW YORK

Kearns Bldg., Salt Lake City, Utah
 414 So. Spring St., Los Angeles, Calif.
 Annex Hotel, St. Louis, Mo.

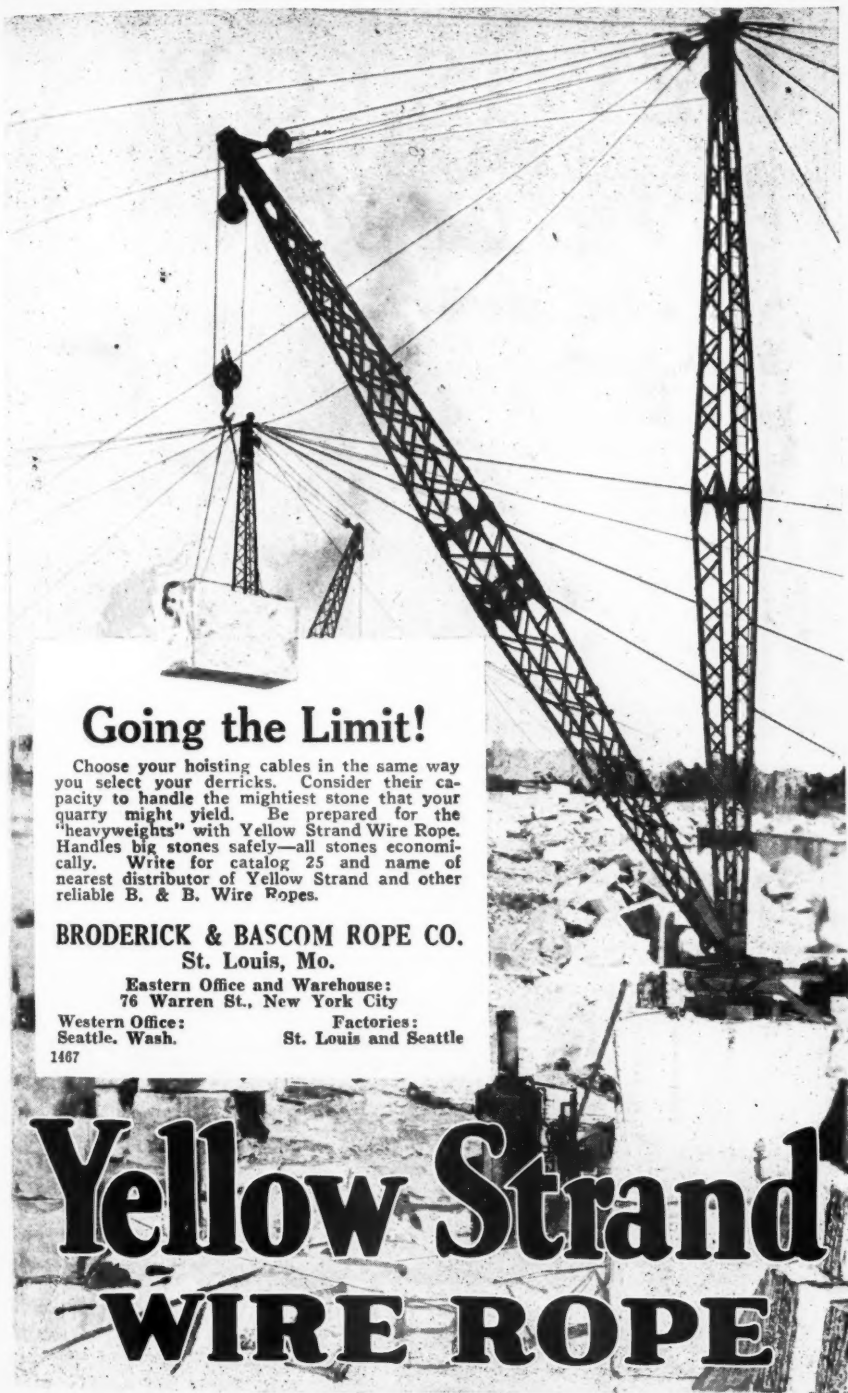
1739 Roanoke Bldg., Chicago, Ill.
 73 Cullinan Bldg., Johannesburg, So. Africa
 40, Rue des Mathurins, Paris, France



Standard Ball Bearing Gearless Crusher.
 Sizes No. 1 to No. 60—Weights 1,000
 to 900,000 lbs.



Gearless Crusher for Fine Crushing.
 Do not be deceived by Vertical Con-
 caves; that is not what makes a fine
 crusher.



Going the Limit!

Choose your hoisting cables in the same way you select your derricks. Consider their capacity to handle the mightiest stone that your quarry might yield. Be prepared for the "heavyweights" with Yellow Strand Wire Rope. Handles big stones safely—all stones economically. Write for catalog 25 and name of nearest distributor of Yellow Strand and other reliable B. & B. Wire Ropes.

BRODERICK & BASCOM ROPE CO.
St. Louis, Mo.

Eastern Office and Warehouse:
76 Warren St., New York City

Western Office:
Seattle, Wash.

Factories:
St. Louis and Seattle

1467

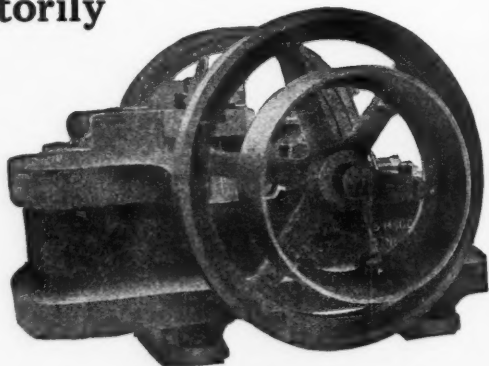
Yellow Strand WIRE ROPE

LEWISTOWN FOUNDRY PRODUCTS

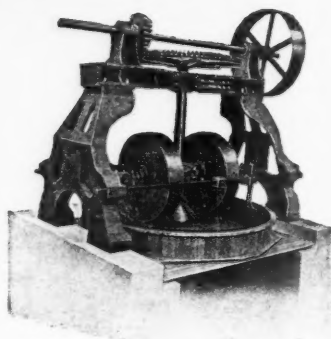
Will satisfactorily
meet your

CRUSHING
GRINDING
SCREENING
WASHING
DRYING
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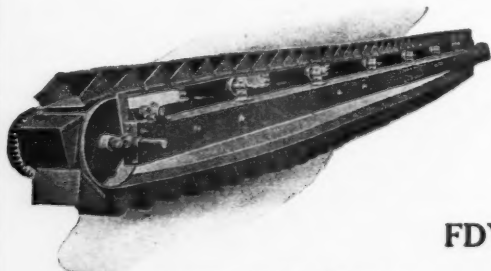
needs



We manufacture a line of equipment for the above purposes in pit and quarry service and shall be pleased to furnish you with any desired information on whatever class of equipment you are interested in.



9-Foot Dry Pan



40-ft. Continuous Bucket Elevator

LEWISTOWN
FDY. & MACHINE CO.
LEWISTOWN, PA.

Evidence of GOOD EXPLOSIVES

MANY of the country's leading quarries rely upon Grasselli Explosives for the economical production of their stone. They know from years of experience that Grasselli *does* help to keep costs down because you get the full benefit of every ounce of strength we put into it.

In planning your quarrying operations for this year, give careful thought to the selection of your explosives—choose Grasselli.



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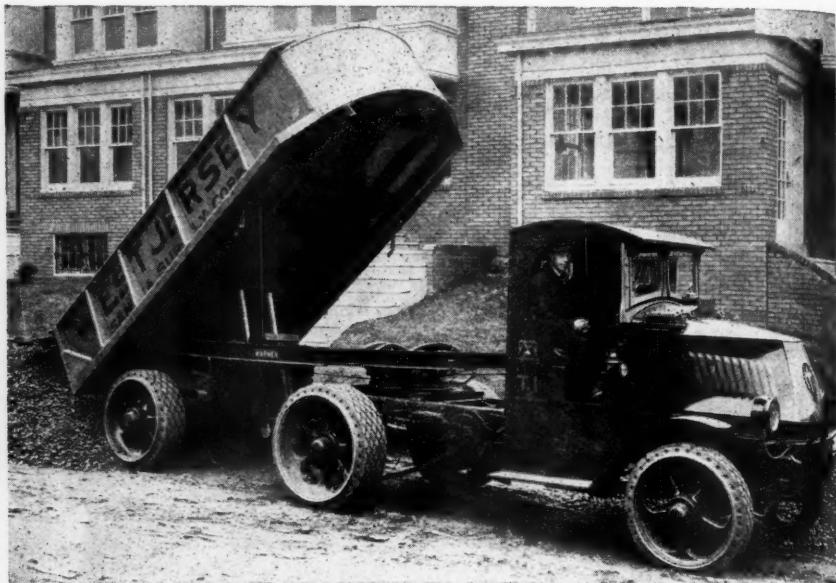


THE GRASSELLI POWER CO.

Main Office: Cleveland, Ohio

GRASSELLI EXPLOSIVES

HEIL QUALITY 25th ANNIVERSARY



New Heil-equipped trailer dump recently placed in the service of West Jersey Sand and Supply Co. The "bay front" body shown above is 13'0" long with a capacity of 243 cu. ft. A standard Heil Hydro Hoist is mounted with the body.

Another Heil Dump Design

YOU will enjoy dealing with Heil because of the competence and originality of Heil Engineering Service. We will be glad to send you any information you may wish on dump units suitable for your work. Of course, you can feel assured that this will obligate you in no way—it is a part of Heil service. Any operator who has been using Heil dumps will be glad to show you why "made by Heil" dump bodies and hoists are the most preferable.

THE HEIL CO.

1139-75 Montana Ave., Milwaukee, Wis.

Sales and Service all over the United States

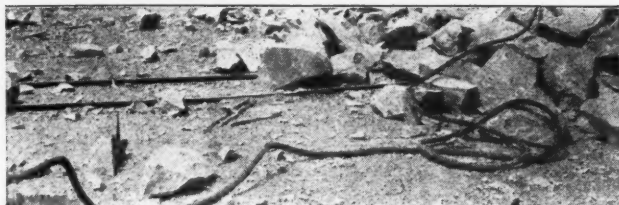
Look

We have compiled our latest Body and Hoist Catalogs in a substantial blue cover folder. It is just what you need for ready reference.

You can get this valuable folder by writing to the Quotation Service Dept. of The Heil Co. or just tearing out this page and mailing it to us.



Use the Best Hose You Can Buy



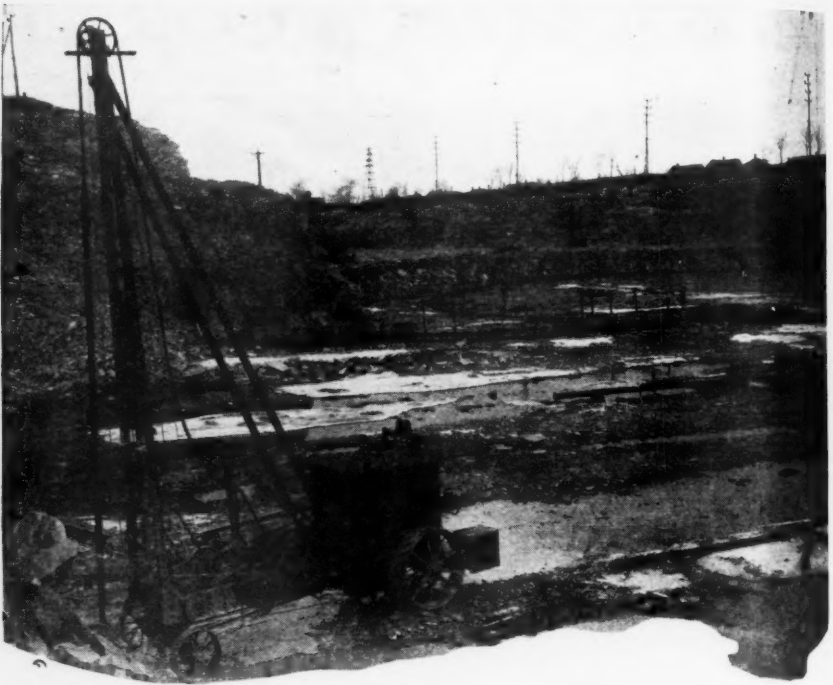
Copyright 1926, by The Goodyear Tire & Rubber Co., Inc.

If you are using pneumatic tools, or considering the purchase of air rigs, bear in mind the importance of getting the best air hose you can buy. Goodyear makes that hose. Foremost builders of pneumatic tools use it for equipment or recommend it.

The scientifically compounded tube resists the action of oil or moisture; the heavy rubber impregnated canvas body is pliant, resilient, and stout. A cover of thick, tough rubber protects Goodyear Air Hose from abrasion and weather.

Ask your supply dealer, or write direct to Goodyear, Akron, Ohio, or Los Angeles, California.

GOOD  **YEAR**
AIR HOSE



“Taking Up Bottom” at Kokomo

THIS Cyclone No. 14 Standard Electric Traction Drill is putting down 18 foot holes, 5½ inches in diameter, on the old quarry floor of the Kokomo Stone Company, Kokomo, Indiana, for the purpose of lowering the floor 16 feet.

Although the holes are short for a big blast hole drill, the machine is doing the work economically when compared with any other method. The traction feature cuts down moving time. The electric motor takes power trouble from the driller's shoulders. The Cyclone geared construction and steel castings eliminate sudden break-

downs. The Cyclone SPUDDING DEVICE assures the maximum drilling speed.

This drill was installed in the summer of 1925 especially for this job, although later it will be used on top. This is the fourth Cyclone No. 14 Drill purchased by the Kokomo Stone Company. They bought their first Cyclone in 1910 when well drills were a novelty for quarry work.

Our 120-page book “Big Blast Hole Drills” will help you to understand why Cyclone Drills predominate in crushed stone quarrying. Write for a copy.

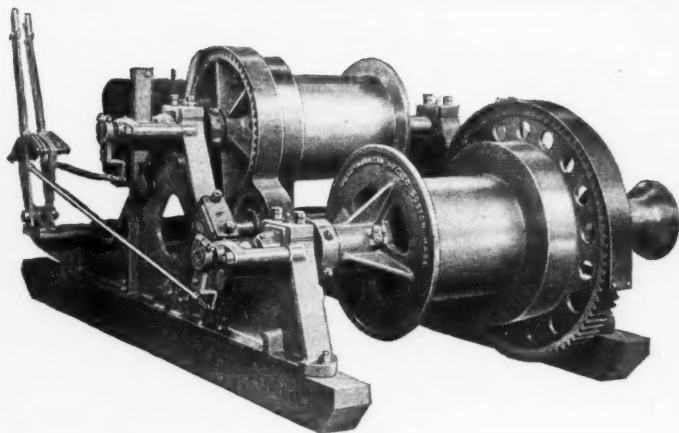
The Sanderson-Cyclone Drill Co.

Orrville, Ohio

Eastern and Export Office, 30 Church St., New York

CYCLONE NUMBER FOURTEEN DRILLS
BIG BLAST HOLE DRILLS

MEAD-MORRISON



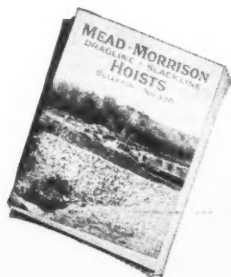
A New DRAGLINE HOIST

Built to stand the heavy duty and severe strain of sand and gravel work. A special high torque, continuous-running motor gives the slow hard pull and speedy return which make for big tonnage. Self-acting brakes handle the load without attention from the hoist man—another reason why the Mead-Morrison Dragline gets a larger daily output.

Write for Bulletin No. 130

MEAD-MORRISON
MANUFACTURING COMPANY
228 PRESCOTT STREET
BOSTON, MASS.

Canadian Factory: Welland
Branch Offices:
New York Montreal Chicago



When one man handles every operation—digging, dragging and dumping—it's money in your pocket to give him the most efficient hoist you can buy. This Mead-Morrison Dragline has asbestos-lined Cone Frictions (easily replaced), Ball Bearings between Thrust Surfaces, Machine Cut Gears Teeth, Silent Chain Drive, Bronze-Bushed Drums, machined all over. Shafts, Gears, Frame and other parts are of unusually strong construction. "Ask the Operator."

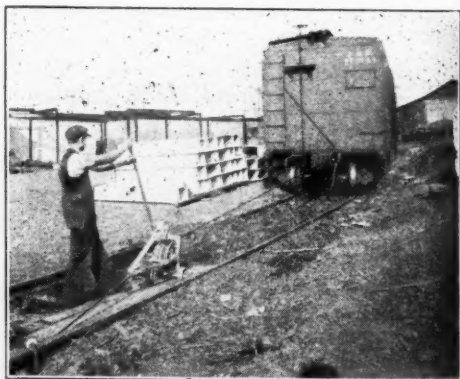
HOISTING - HAULING - HANDLING



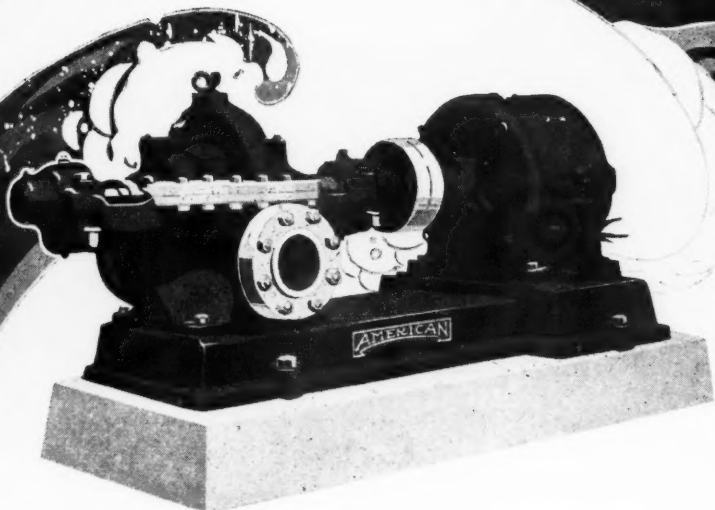
Handy-Andy Junior

The Big Little Puller

Simple, all-steel, portable, one-man puller for spotting and pulling cars, moving heavy machinery, hauling out stalled and overturned trucks, etc. 10 to 40 tons capacity. Weighs 180 pounds. Has automatic reverse. Made in power sizes also. Write for circular B for details.



John Waldron Corporation
NEW BRUNSWICK NEW JERSEY



District Sales Agencies: "American" pumps are husky in design. All bearings are of generous proportion. Each type is compact. Wide footings and ample bases give great rigidity. Hydraulic efficiencies are high. And each "American" pump is absolutely guaranteed for the service for which it is recommended!

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THE AMERICAN WELL WORKS

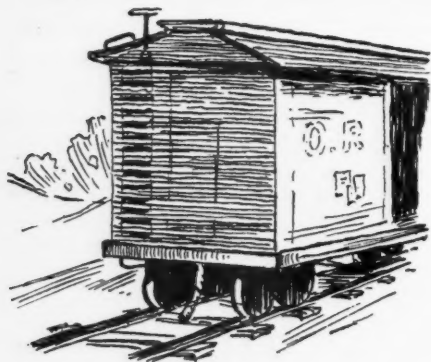
General Office and Works—Aurora, Illinois

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AMERICAN
AURORA, ILL.

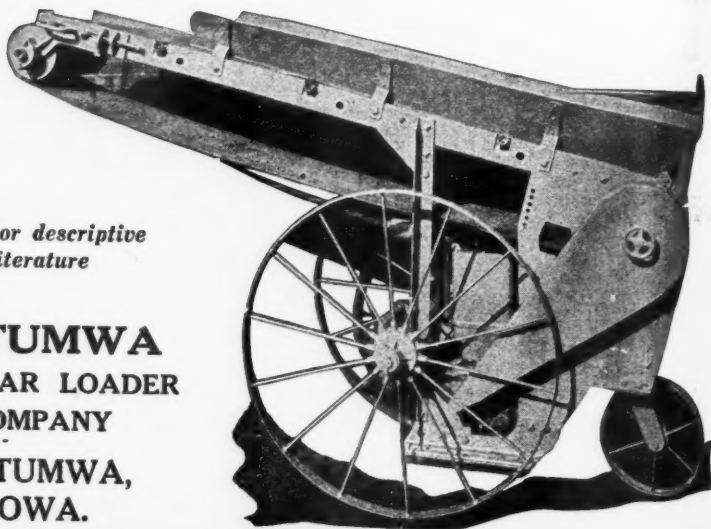




*Lower Freight
Rates are Desir-
able, But Its
More Practical to*

Cut Your Loading Costs!

An Ottumwa Loader is better than a whole loading gang. The most economical and efficient method of loading box cars. Better install it!



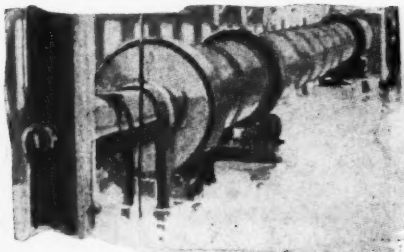
*Send for descriptive
literature*

**OTTUMWA
BOX CAR LOADER
COMPANY
OTTUMWA,
IOWA.**

TRADE MARK REG. U. S. PAT. OFF

BRISTOL'S

RECORDING PYROMETERS



Lime-burning temperatures in rotary or vertical kilns are recorded by Bristol's Pyrometers.

Savings
and
Efficiency
in

CALCIUM PRODUCTS MANUFACTURE

Calcining of gypsum in rotary kiln or of lime in rotary or vertical kiln; of cement in the big rotaries; or roasting furnaces in calcining of phosphate rock; and brick burning in tunnel kilns—these are some of the places where Bristol's Recording Pyrometers are used to your advantage.

These PYROMETERS record on a chart the actual temperatures of the process. With such a record before him the operator knows what the temperature is now, what it has been, and the direction in which it is leading. Having such information he is able to secure close control without waste of fuel and with no spoilage of the product due to wrong temperatures.

Bristol's have been making Pyrometers for 36 years. Any Bristol's representative will tell you just the right equipment to use for your particular work.

Write for Pyrometer Catalog 1401

The Bristol Company  *Waterbury, Connecticut*

FOR 36 YEARS

Ask Any
Technical
Engineer

MAKERS OF

BRISTOL'S

RECORDING
INSTRUMENTS



1 ton or 1000

Foster Service for Mines and Quarries

Unmatched prices on New Rails and Track Accessories.

30% to 50% Savings on guaranteed Relaying Rails.

Immediate Shipment—any quantity—all from one source.

Phone, write or wire your inquiry—Prompt reply.

L.B.FOSTER COMPANY
PITTSBURGH ~ CHICAGO ~ NEW-YORK

Designed to take a Choke Feed

Here's a Reduction Crusher that not only will take a choke feed but actually works at its best that way. This isn't accident—it's design—*Telsmith Design*.

The openings in Telsmith's big, open feed hopper are so large that they permit an unregulated gravity feed. Automatic feeders are not necessary. Cover it with rock—five, ten, even twenty feet deep—there will be no stalling, no digging out of rock with Telsmith on the job.

With its enormous discharge circle—increased by the outward flare of the head and concaves—Telsmith discharges, as it feeds—by gravity—without centrifugal action and with very slight wear upon the spider arms.

Telsmith performance is *INSURED*—pillar shaft, steel frame and steel crown are *guaranteed* against breakage by tramp iron. Bulletin No. 2F15 gives all the details. Send for it today.

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Milwaukee, Wisconsin

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Columbus, Ohio.

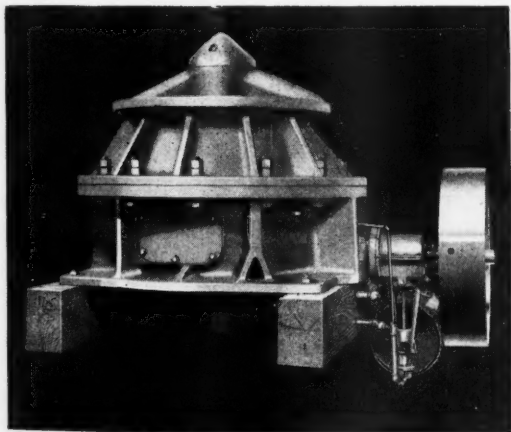
Knox Eq. & Eng. Co.,
Indianapolis, Ind.

Borchert-Ingersoll,
Inc.,
St. Paul, Minn.

Geo. F. Smith Co.,
St. Louis, Mo.

Bunting Hdw. &
Mchy. Co.,
Kansas City, Mo.

R. C. No. 1



TELSMITH



EFFICIENT
ECONOMICAL SCREENING
at the Neil F. Ryan Sand & Gravel Plant

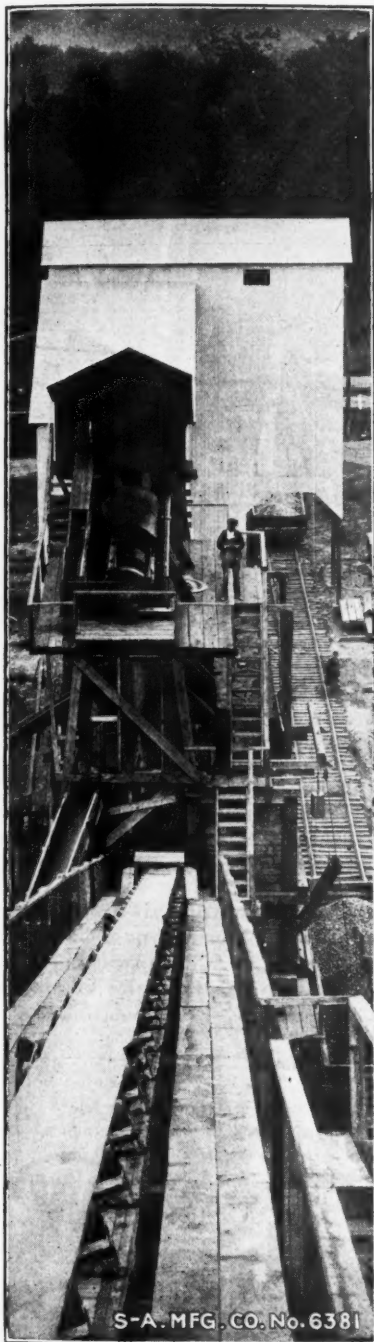
A Universal Vibrating screen in use at the Neil F. Ryan Sand and Gravel plant near Schenectady, N. Y., plays an important part in the efficient system upon which that plant is operated. It sizes material $3/16$ to $1/2$ inch in size.

Universal Vibrators because of their economical, dependable performance have won recognition and favor everywhere.

Copy of our latest price letter, catalog and literature mailed on request.

UNIVERSAL VIBRATING SCREEN CO.

RACINE - - WISCONSIN



S-A. MFG. CO. No. 6381

S

A

SCREENING AND WASHING PLANTS

Are your operating costs too high for the yardage produced? Is the product clean and accurately sized?

These are a few of the questions that seldom bother operators of plants designed and equipped by S-A Engineers.

There can be no standard layout and equipment for a plant. The varying nature of gravel deposits call for plants of individual design.

Write us. An S-A Engineer will be glad to study your problem and make helpful suggestions.

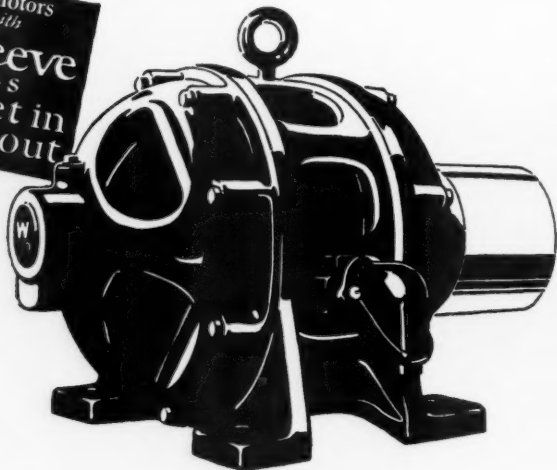
Stephens-Adamson Mfg. Co.

Aurora, Illinois Los Angeles, Calif.



S-A Gilbert Screen with a preliminary scrubbing barrel for a clean, accurately sized product.

Westinghouse Motors
are equipped with
Sealed Sleeve
BEARINGS
Dust can't get in
Oil can't get out



Sealed Sleeve Bearings

Now on Westinghouse Motors

PRACTICALLY every mechanical engineer knows the advantages of the sleeve bearing; how the larger bearing surface makes for longer life; how sleeve bearings utilize a film of oil for cushioning protection; and why sleeve bearings never cause unexpected shutdowns because of sudden breakdowns.

In Westinghouse *Sealed Sleeve Bearings* those advantages have been

made doubly sure. An absolutely air tight housing keeps dust and grit *out* of the bearing and all oil *in* the bearing, thus eliminating the chief cause of insulation troubles. The oil cannot spread to the insulation.

In developing this *Sealed Sleeve Bearing* Westinghouse has again demonstrated its capacity to perfect and apply principles of proved superiority.

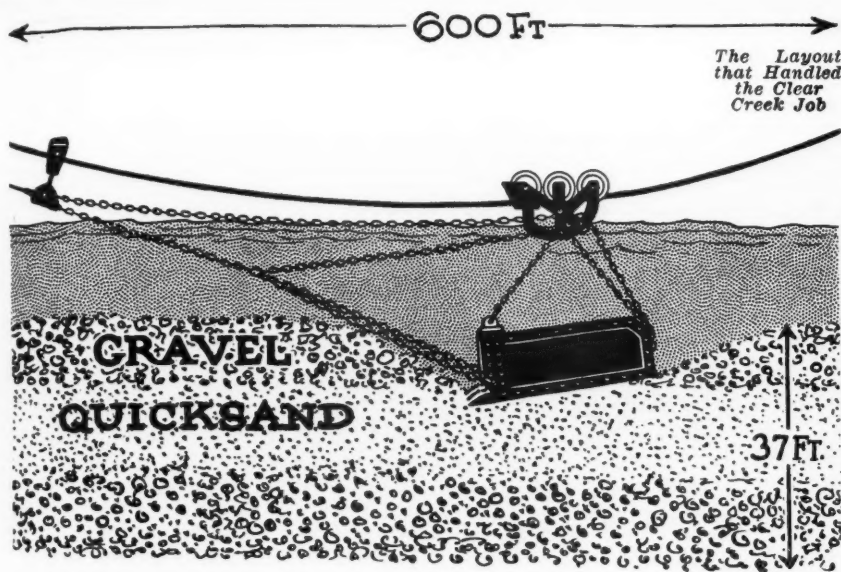
Send for the "Evidence"

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY
EAST PITTSBURGH · PENNSYLVANIA

*Sales Offices in all Principal Cities of the United States
and Foreign Countries*

Westinghouse





The Layout
that Handled
the Clear
Creek Job

Digging Where All Other Methods Had Failed



The 1 yard Sauerman Bucket
coming up out of Clear Creek
with a heaping load.

This is what the manager of the
Clear Creek Plant Says—

"On October 17, we started the
Sauerman slackline cableway in
operation. This method of taking
gravel from the river bed is proving
very satisfactory and in our belief
is the only way that excavating
can be carried on with any degree
of success at our location.

The gravel we are getting out is
very solidly imbedded in quicksand,
but with the Sauerman bucket we
are able to dig to the full depth of
the deposit, which is 27 ft. in
places. We have no trouble what-
ever in making the bucket nose
into the material and fill quickly.
We are especially pleased with the
Sauerman two-speed electric hoist.
It is smooth-running and easy to
operate and handles the bucket re-
markably fast."

These excellent results have led at
least to one other important Sauer-
man installation on Clear Creek.

There are some dandy digging jobs
—as well as sand and gravel pit
layouts—in this month's SAUER-
MAN NEWS. Send for a copy.

Clear Creek, Colorado, contains an excellent gravel deposit. But, about two feet below its surface lies a strata of rock bearing quicksand—treacherous stuff that ordinary digging equipment cannot handle successfully.

One man had an idea that the deposits could be worked at profit. He turned to Sauerman—and a Sauerman Slackline Cableway handling a 1-yard bucket over a 600-foot span, was installed—operated by a Sauerman Two-Speed Electric Hoist.

From the very first, this equipment was able to operate at a profit—going down as far as 27 feet through the treacherous quicksand formations.

This installation illustrates the adaptability of Sauerman Cableway Excavators—and their ability to handle the toughest of digging jobs.

Quicksand diggings—underwater digging—rough ground diggings—and similar work hold no terrors for them.

In addition, Sauerman Cableway Excavators perform three distinct operations:

They dig—They carry—They lift—

And one man, the hoist operator, is all the gang needed to handle the three.

Wherever excavating is to be done over a relatively large area—wherever the material must be lifted and conveyed over a distance of from 200 to 1,000 or more feet—Sauerman Cableway Excavators show the lowest possible costs per yard—and for the investment, the greatest digging speed.

For those reasons, Sauerman Cableway Excavators are chosen for such work as the Clear Creek Job—for sand and gravel pit digging—for stripping overburden—for reservoir excavating and cleaning—for levee building—and for similar digging projects.

For a more detailed picture of the types of work on which Sauerman Cableway Excavators are saving money, send for this month's issue of the **Sauerman News**. It shows details and layouts on a number of jobs.

Just ask for this month's Sauerman News.

SAUERMAN BROTHERS, INC.
434 S. Clinton Street, Chicago, Illinois
Representatives in 29 Principal Cities

SAUERMAN

SLACKLINE CABLEWAYS : POWER DRAG SCRAPERS

The WILLIAMS Bucket develops its digging power with a shorter cable overhaul, as the 4-part or 3-part closing pull is multiplied by the leverage of the WILLIAMS power arm. By the tandem arrangement of the sheaves on the power arm, the lever and block-and-tackle are combined in the one way that gives a *straight line* closing pull. Not the slightest "side lead" to waste power by high friction at the sheave pins. And the straight cable leads save both sheaves and cable.



**"Yes,
It's All Bucket!"**

No counterweights on any WILLIAMS. The weight is all built right into the bucket, where it adds strength as well as digging power.

That's why you see WILLIAMS Buckets all over the country giving good service today, after 15 years or more of hard work. As another owner writes: "After handling crushed rock and dredging gravel since 1909, our WILLIAMS is still at work and has had only minor repairs." (Name on request).

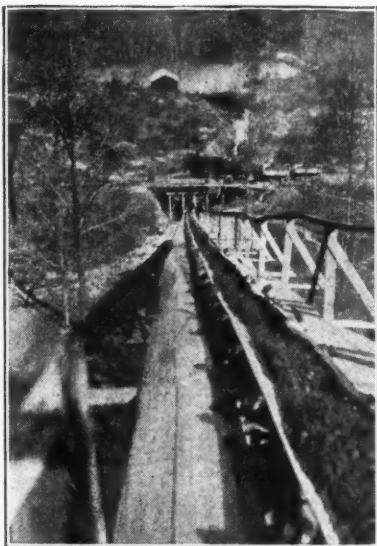
Built so well that it is guaranteed against breakage.

Tell us your bucket requirements. There is a WILLIAMS that will give you the output you need—on excavating or rehandling. And continue to do it for years. Because every WILLIAMS is ALL BUCKET!

G. H. WILLIAMS COMPANY, 605 Haybarger Lane, Erie, Pa.

Eastern Sales Office: 30 Church Street, New York City

WILLIAMS
FAST-DIGGING BUCKETS
 All Parts Guaranteed Against Breakage



***"U. S." Belting Conveys
1,000 Tons Per Day
—in the Spruce Pine Sand
and Gravel Plant***

Good conveyor belting plays an important part in the everyday operation of the up-to-date sand and gravel plant. Efficient conveyor belting installations substantially reduce material handling costs.

In this Spruce Pine Sand and Gravel Plant, Spruce Pine, Ala., fully described in this issue of "Pit and Quarry," "U. S." Security Belting is conveying 1,000 tons daily a distance of 750 feet to the washing and screening plant. The plant managers report entire satisfaction with the service of this "U. S." Belt.

Let us tell you more about "U. S." Conveyor service.



Trade Mark

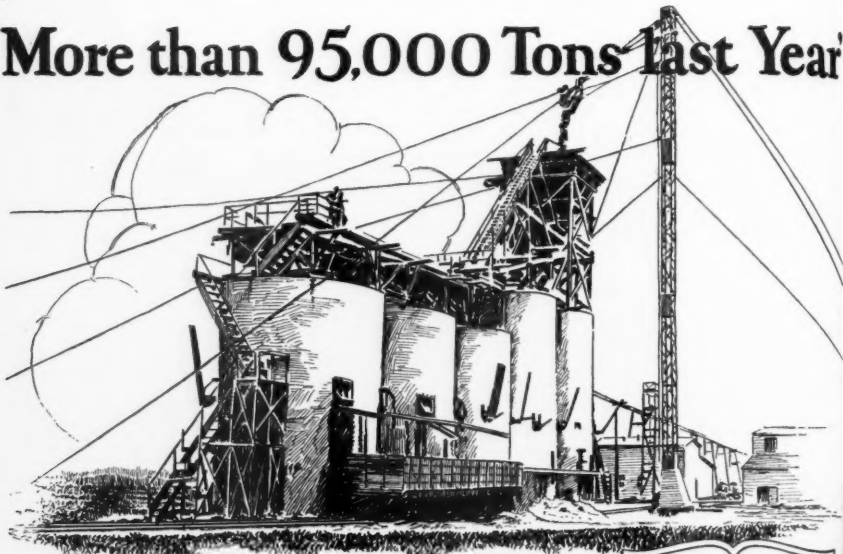
United States Rubber Company

1790 Broadway

New York City

Branches in all industrial centers

"More than 95,000 Tons last Year"



HE sand and gravel plant using the dragline cableway system of excavation must have dependable hoist equipment. In fact, this is the "prime mover" upon which all subsequent operations depend.

A great many sand and gravel plants throughout the country have learned from experience that the Mundy Hoist can't be beat for this class of work. It has been put to the acid test and in every case emerged successful.

For instance, at the Lenawee Sand and Gravel Co., Tecumseh, Mich. A Mundy, two drum, 50-h.p hoist successfully operates a 1 $\frac{1}{2}$ yard dragline cableway system. It works a deposit some 47 acres in extent running 90 ft. in depth, and lifts the material to the top of the plant, an elevation of 75 ft. above ground level. The capacity of the plant is 1500 tons daily and this achieved through the successful operation of their Mundy Hoist.

A New 40 page bulletin fully describing Mundy gasoline hoisting equipment has been published. You can get your copy by dropping a card.

Ira W. Ashley, Secretary of the Lenawee Sand and Gravel Co., Tecumseh, Michigan, writes:

"We are using a 50 h. p. double drum Mundy Hoist. This hoist was a used machine when we purchased it and we have used it two years with very satisfactory results and with a very low repair bill. We have produced more than 95,000 tons this season"

The Mundy Sales Corporation

Distributors for the J. S. Mundy Hoisting Engine Co.

30 Church St., New York

Agents in Principal Cities

TRADE MARK
MUNDY
ESTABLISHED 1869

HERCULES ON THE JOB

In Excavating Machinery

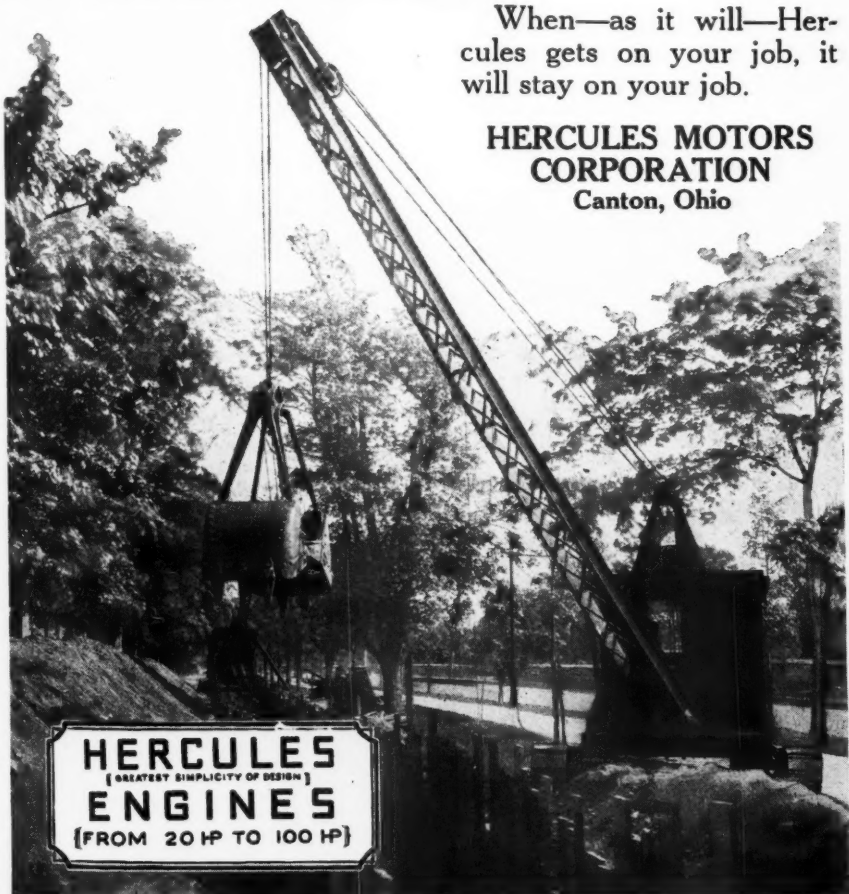
To move dirt, power is needed!

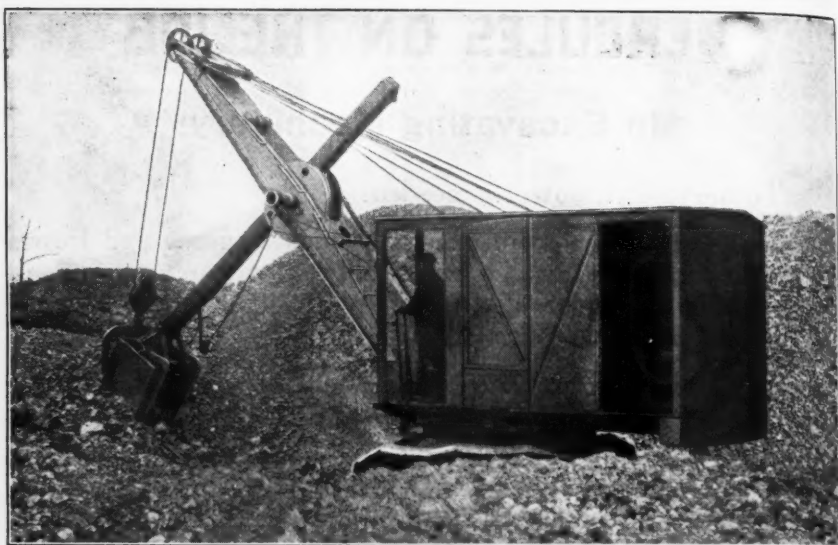
It is therefore natural that Hercules Engines and Power Units are being used in this heavy duty service in ever-increasing numbers. For Hercules has proven itself steadfast—on the job—throughout American Industry.

The builder of the excavating machinery who buys power from Hercules buys more than an engine. He buys simplicity and economy of installation for himself. He buys performance insurance for his customer, the operator.

When—as it will—Hercules gets on your job, it will stay on your job.

**HERCULES MOTORS
CORPORATION**
Canton, Ohio





Here it is—The Big Surprise

For Users of Power Shovels, Clamshells and Draglines

The LORAIN 75

The Gasoline Machine that Really Meets Today's Needs

WEIGHS but little more than $\frac{3}{4}$ yard shovels, yet has the power and working capacity of $1\frac{1}{4}$ yard machines. Requires no more clearance room for house, rear end swing or boom radius than a $\frac{3}{4}$ yard, yet has the digging and dumping range of the larger machine.

Has a surplus of power, more than is required, yet possesses strength throughout greater than any strain that this surplus power can develop. You can stall the engine (powerful as it is) without over-straining any part. Permits operating speeds up to any limit that will be found practicable.

Light as it is, has ample stability for

shovel service with dipper of $1\frac{1}{4}$ yard capacity and crane booms up to 50 feet in length.

Has three lever control and requires no greater physical effort by operator than a steam machine. All parts unusually accessible for lubrication and adjustment and easily visible for observation.

These and many other advantages are secured by new and unusual methods which so simplify the mechanical movements and cut down the number of parts that less attention is required and much longer life is assured.

And—It's mounted on the Center Drive Truck.

Send for Further Details

THE THEW SHOVEL COMPANY, LORAIN, OHIO

Pit and Quarry

Index to Advertisers

Vol. 11

CHICAGO, ILL., FEBRUARY 15, 1926

No. 10

Advance Foundry Co.....	4	Leschen and Sons Rope Co., A....	67
American Hoist & Derrick Co.....	18	Letson Co., T. H.....	110
American Steel and Wire Co.....	126	Lewistown Foundry and Mach. Co.	26
American Well Works.....	33	Lidgerwood Mfg. Co.....	133
Armstrong Mfg. Co.....	128	Loomis Machine Co.....	119
Atlas Car & Mfg. Co.....	116	McEwen Bros.	131
Austin Mfg. Co.....	121	McLanahan-Stone Machine Co....	128
Bacon, Inc., Earl C.....	117	Mac Neal, D. B.....	108
Bay City Dredge Works.....	118	Magnetic Mfg. Co.....	135
Blaw-Knox Co.	124	Manganese Steel Forge Co.....	129
Bradley Pulverizer Co.....	16	Marion Steam Shovel Co.....	120
Bristol Co.	35	Mead-Morrison Mfg. Co.....	31
Broderick and Bascom Rope Co....	25	Minneapolis Steel and Machy. Co..	133
Brookville Truck & Tractor Co....	6	Mitshkim Co., M.....	108
Brown Hoisting Machy. Co.....	48	Morris Machine Works.....	105
Browning Crane Co.....	125	Morrison and Risman Co., Inc....	111
Buckeye Dryer Co.....	130	Mundy Sales Corp.....	44
Buda Co.	Front Cover	Naylor Spiral Pipe Co.....	121
Burch Plow Works Co.....	130	Nazareth Foundry & Machine Co..	120
Burkhardt Co.	50	New Holland Machine Co.....	117
Burnham, Royal E.....	118	O. K. Clutch & Machinery Co.....	134
Burrell Eng. and Const. Co.....	116	Ohio Locomotive Crane Co.....	125
Caldwell and Son Co., H. W.....	134	Orr & Semower, Inc.....	132
Chicago Perforating Co.....	118	Ottumwa Box Car Loader Co.....	34
Clyde Iron Works Sales Co.....	23	Owen Bucket Co.....	118
Conveying Weigher Co.....	124	Pennsylvania Pump and Compres- sor Co.	119
Diamond Machine Co.....	132	Perfect Classifier Co.....	131
Domestic Engine & Pump Co.....	126	Pittsburgh Machinery & Equip. Co.	110
Du Pont de Nemours & Co., E. I..	9	Randolph-Perkins Co.	118
Eagle Iron Works.....	117	Rennolds Equipment Co.....	110
Easton Car and Const. Co.....	15	Russell & Co.....	8
Economy Pumping Machy. Co.....	118	St. Mary's Oil Engine Co.....	116
Ensign-Bickford Co.....	128	Sanderson Cyclone Drill Co.....	30
Equipment Corporation of America	109	Sauerman Bros.	41
Erie Pump and Engine Works.....	118	Seaverns Co., James B.....	120
Erie Steam Shovel Co.....	3	Smith Engineering Works.....	37
Fate-Root-Heath Co.	68-69	Sonntag, C. H.....	122
Flory Mfg. Co., S.....	123	Southern Iron & Equip. Co.....	108
Foster Co., L. B.....	36	Spears-Wells Machinery Co.....	127
Galland-Henning Mfg. Co.....	17	Speeder Machinery Corp.....	117
Gay Co., Rubert M.....	122	Stephens-Adamson Mfg. Co.....	39
General Motors Truck Co.....	10-11	Stevenson Co.	20
Goodyear Tire and Rubber Co.....	29	Symons Bros. Co.....	2
Grasselli Powder Co.....	27	Taylor-Wharton Iron and Steel Co.	122
Gruendler Patent Crusher and Pulverizer Co.	119	Thew Shovel Co.....	46
Hadfield-Penfield Steel Co.....	12	Thomas Elevator Co.....	119
Harding Co.....	121	Toepfer and Sons Co., W.....	118
Harnischfeger Corp.....	19	United States Rubber Co.....	43
Hayward Co.....	123	Universal Crane Co.....	21
Heil Co.	28	Universal Vibrating Screen Co....	38
Heineken, W. P.....	111	Used Equipment Bargains.....	108-116
Hendrick Mfg. Co.....	127	Vulcan Iron Works.....	14
Hercules Motors Corp.....	45	Waldron Co., John.....	32
Hyman-Michaels Co.....	111	Waukesha Motor Co.....	13
Industrial Works.....	70	Western Wheeled Scraper Co.....	107
Insley Mfg. Co.....	22	Westinghouse Electric & Mfg. Co.	40
Kansas City Hay Press Co.....	116	Whitcomb Co., Geo. D.....	7
Kansas City White Metal Co.....	111	Willamette Iron and Steel Works..	122
Kennedy-Van Saun Mfg. and Eng. Corp.	24	Williams Co., G. H.....	42
Koehring Co.....	5	Wood Drill Works.....	123
Koppel Industrial Car & Equip- ment Co.	Back Cover		

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Pit and Quarry

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No. 10

FEATURE CONTENTS

Invading an Already Crowded Territory Successfully Accomplished.....	53	Pass it on
An illustrated article by E. D. Roberts featuring the operations of the Hartland Sand and Gravel Company of Milwaukee, Wisconsin.		..... President
Compressed Air and Air Compressors..	59	..... Vice-Pres.
The first part of a practical article by C. H. Sonntag. This number concerns compressed air, the gas laws, specific heat at constant volume and constant pressure, adiabatic compression and isothermal compression.		..... Secretary
The Human Element in Plant Operation.	65	..... Treasurer
A. B. Mack, Asst. Gen. Mgr., Kelley Island Lime and Transport Company, presents an interesting viewpoint.		..... Gen. Mgr.
An Efficient Material Handling System Keynote to Service in this Instance....	71	..... Sales Mgr.
An illustrated article concerning the operations of Neil F. Ryan of Schenectady, New York.		..... Traffic Mgr.
Insurance Against Windstorm.....	75	..... Engineer
Dwight Ingram writes an informative and entertaining article.		..... Supt.
Producing Talc at Waterbury, Vermont..	79	..... Foreman
An illustrated article by F. A. Westbrook, featuring the operations of the Eastern Magnesia Talc Company.		..... Purch. Agent
A Market Problem Profitably Solved by this Crushed Stone Company.....	85	
An illustrated article by H. W. Munday, featuring the operations of the Standard Paving Company of Tulsa, Oklahoma.		
Loading Sand and Gravel by Derrick...	91	
Hydraulic Dredge Efficiency Features this New Sand and Gravel Plant.....	93	
Quarrying in a Historic Valley.....	97	
An Economical Plant Investment Return- ing Good Dividends.....	103	

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Pit *and* Quarry

Vol. 11

Chicago, Ill., February 15, 1926

No. 10

What Are Your Costs?

DURING the recent convention of the National Crushed Stone Association at Montreal, it was our pleasure to be present at many informal group discussions at which some valuable data on production methods were exchanged. However whenever an inquiry on costs came up the questioner was seldom satisfied. The reply was evasive, uncertain or denied the questioner the information. The frequency of questions relating to costs were interesting because of our personal knowledge of the individual plants concerned in several of these discussions. Some of these individuals do not know their own costs. Private discussions with seventeen individuals revealed the amazing fact that no two of them agree in their explanation of what costs are. Because we believe that the use of standard costs provide a most valuable stabilizing executive control we shall venture to present our interpretation.

First let us inquire, what are costs? You hear of actual costs, predetermined costs, standard costs, etc., until your head quite naturally swims with confusion. In our observation, experience and study we find actual costs are not only rarely found but that they are of little use and selling prices are seldom if ever determined by what can be truthfully called actual costs.

When discussing the subject of costs it is necessary to know just what approach is being made. The costs of the finished product are one thing while the costs of individual operations based upon performance in that operation are entirely different. As an example, when a plant generates its own power, the cost per kilowatt hour should be known, but this has no relation whatever to the finished product. The indirect expense or "burden" of a producing department is often best measured by its relation to the direct or producing hours actually involved in manufacturing the product. But here again the figuring of this particular element

of cost is considered, determined and controlled entirely aside from any consideration of what product is actually being made.

Costs should be so arranged that they serve as a real guide, both to the foremen or superintendents who are directly responsible for the different operations as well as to the executive management which must judge the efficiency shown by the various foremen or superintendents. Because of this a cost system which merely shows month by month what occurred is of little value as compared to a system which shows how the actual monthly costs compare to a standard cost which should be reached. Standard costs may be considered as the cost which should be reached under the conditions of operation which prevailed at the time the work was performed. As an example, at 60 per cent capacity, each operation in the plant should produce at a certain standard cost. The actual cost compared to this standard gives the executive management a trustworthy control of his organization.

The term "predetermined cost" is used generally for the costs of all operations based on capacity or normal operation. This cost is the basis of determining selling prices. It may be that normal operation is not plant capacity. The plant must be assumed to run at a certain rate of production in determining the selling price. In such a determination the plant should be considered to be operating at capacity because the cost of idle plant and equipment cannot be charged to customers through selling prices for the plain reason that customers will not pay such prices. Many producers believe that the customer pays for the idle time of winter shutdown, delays, etc. If a comparison is made with other industries and some of the more modern plants in relation to unit profit the truth will be quickly revealed that the producer is carrying the load.

Standard costs or the costs of the various operations, with a direct labor

and a direct material cost set on each operation, furnish a stabilizing executive control which cannot be attained by any other method. Budget control is not effective unless standard costs have been established because the two are inseparable. The standard costs at varying capacities are necessary because this data is needed for proper budgeting. Only when this combination is effected will there be a control which eliminates guess work

and establishes instead a correct measure of the efficiency of each operation.

The important fact is that stabilized executive control requires that performance be judged by comparison with trustworthy standards. The executive must provide the system by which the standards can be determined with the advice and counsel of everyone concerned. This procedure will result in executive control becoming effective.

T. R. Barrows

MANY readers of Pit and Quarry will be grieved to know that T. R. Barrows, executive secretary of the National Sand and Gravel Association, died at Atlanta, Georgia, on January 31, 1926. Mr. Barrows contracted influenza during the recent Tenth Annual Convention of the National Sand and Gravel Association at Atlanta. He was removed to the

training served him well and the bulletin at once became a publication sought for and diligently read by all who received it. Only a year later, in the early part of 1922, the added duties of executive secretary were assumed by Mr. Barrows. His practical legislative experience enabled him to discharge his duties with marked effect.

For those who may have forgotten, let us recall that the sand and gravel industry in 1920 and 1921 was very much demoralized. The National Association was far from being a sound institution. Groups and units of sand and gravel producers were disintegrating rapidly. Frictions and misunderstandings existed to a serious extent. Compare this with the situation today and you will agree that marked progress has been made to account for the sound and unified association and the firm position of the sand and gravel industry as a whole. The part T. R. Barrows played in this change will never be fully known because his work of uniting and organizing was to a great extent with individuals. His administration both of the office of executive secretary and of editor of the Sand and Gravel Bulletin represent a record of accomplishment that should not be forgotten.

It was under the tireless direction of T. R. Barrows that the association developed to its present position of national prominence; that its membership increased annually; that it reached a position of sound finances; that it rendered the most complete service possible to every member to the fullest extent of its resources.

In all our relations with Mr. Barrows we found him to be quiet, convincing, thorough and in every instance his action was free from any political twist which is so often associated with such service as he rendered. The death of T. R. Barrows is a great loss. H. W. M.



T. R. Barrows

Davis Fischer Hospital on Thursday, January 21st. A number of prominent Atlanta physicians were called and everything possible done. The funeral was held at Hendersonville, North Carolina, on Wednesday, February 3, 1926.

It was on January 10, 1921, that Mr. Barrows became affiliated with the N.S.G.A. as editor of the Association's bulletin. His newspaper

Invading An Already Crowded Territory Successfully Accomplished

By E. D. Roberts

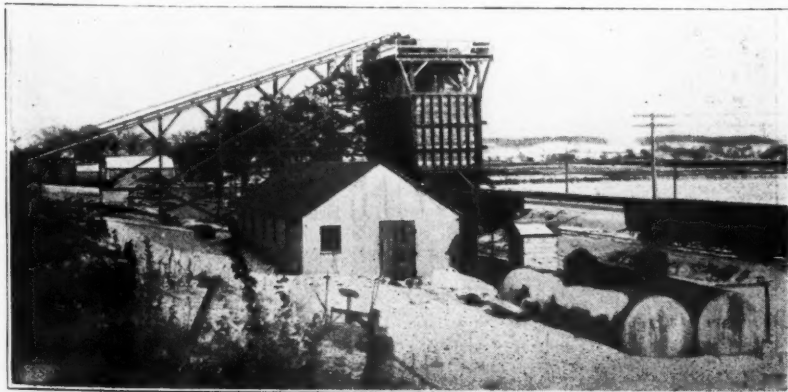
INVADING the already overcrowded Milwaukee market with a gravel and crushed stone plant producing 750 tons daily and marketing their full capacity from the start is the novel experience of the Hartland Washed Sand and Gravel Company. Operations were started October 1st and suspended by cold weather but due to the encouragement received, the Palmer brothers, who own the Company, have decided to double the capacity of the plant when they resume operations this spring. At the start everything was laid out with this end in view and all that is required to produce 1500 yards each shift is the installation of a second unit for the final sizing and washing.

The pit of the Hartland Washed Sand and Gravel Company is located just west of Hartland, Wisconsin, which is about 25 miles west of Milwaukee on a paved state highway and alongside the main line of the Chicago Milwaukee and St. Paul railroad. A side track has been laid alongside the bunkers which are also within 150 feet of the paved highway insuring a ready access to market for their output.

During the glacial period, a moraine was laid down rising 90 feet above the plain and with only a thin coating of soil before good, clean gravel is reached. This soil covering, of about 12 inches, is scraped to one side. The material is exceptional for the Mil-

waukee territory in that 75 per cent of the bank is gravel and stone of which only 20 per cent has to be crushed. A small percentage of silt and very fine sand is carried in the gravel which is removed by washing. There is every reason to believe the bank is of excellent depth for a well sunk 50 feet below the plain went through this same material all the way. This assures a bank of 150 feet when the deposit is well opened up.

The gravel is excavated by a Sauerman crescent scraper operated by a 55 horsepower Wagner motor directly connected to a double drum Thomas hoist. The drag scraper discharges into a hopper leading the material to a Telsmith plate feeder which draws the material from the hopper at an even rate and discharges it onto a primary grizzly allowing the smaller sizes of stone to fall through into the boot pit of an inclined bucket elevator. The larger rock slides down the sloping bars, forming the grizzly, into a Number 8 Telsmith crusher that discharges the crushed rock to the elevator just mentioned. Both the fine and crushed material is discharged from the elevator onto another inclined grizzly which allows the fines to fall down a hopped chute to a belt conveyor operating under this hopped chute, onto the scalping screen and under a final crusher. The material which does not pass through the



General View Showing Bunkers, Power House and Oil Storage

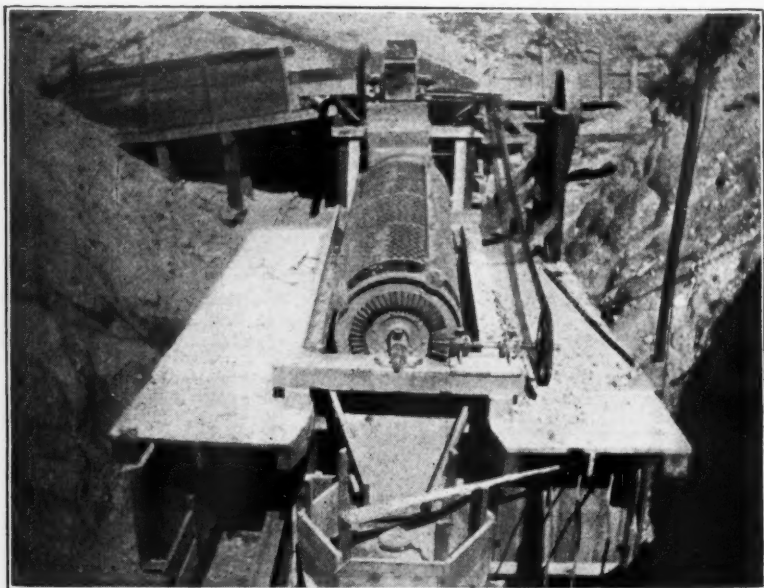


Bunkers Viewed from State Highway

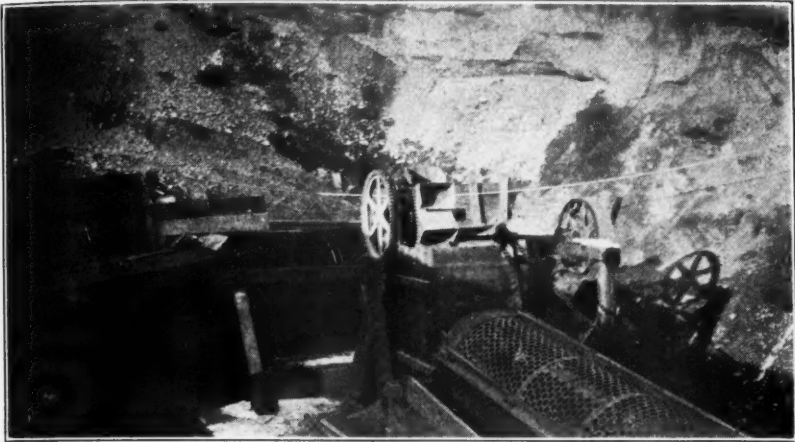
grizzly slides onto a scalping screen which passes everything under 2 inches in size into a hoppers chute leading to the previously mentioned conveyor belt and discharges the over-size rock to a Number 3 Tel-smith crusher. This crusher makes the final reduction. As stated before, the discharge from the grizzly, scalping screen and Number 3 crusher falls directly onto a belt conveyor. This belt conveyor operating on 195 foot centers passes underneath the state highway in a reinforced concrete tunnel 6 feet wide and 8 feet high and

then up an incline to the sizing bunkers on top of the shipping bunkers.

As the sand and gravel enter the revolving screen, a stream of water is played on it to carry off the fine sand and silt in solution or suspension. The sand and water passes through the screen while the remainder is sorted into three grades and discharged directly into bins below. The sand and water enters two Tel-smith settling tanks set in series. These grade the sand into two sizes. These two grades of sand also fall directly into bins below and make in all five



Scalping Screen and Reduction Crusher



Receiving End of Screen

grades of sand and gravel; two of sand, pea gravel, $\frac{5}{8}$ to $1\frac{1}{4}$ inch and $1\frac{1}{2}$ to 2 inch material.

There is a spout directly underneath each bin for truck shipments while five movable sloping spouts on the railroad side of the bunkers direct the sand and gravel into cars for rail shipments.

The sizing screen was placed over one side of the bunkers to allow another unit to be installed later for doubling the output of the plant. The

present pump is to be replaced by one throwing 1,000 gallons a minute when the other screen is added. These pieces of equipment and changes are all that are required for the increase.

The dirty water from the settling tanks is led to a marshy area down the railroad track where the material in suspension is deposited thereby reclaiming it for use.

Several handicaps had to be overcome in the construction of the plant, The



Tunnel Under Concrete Highway for Conveying Gravel to Bins



End View of Bunkers Showing Loading Facilities

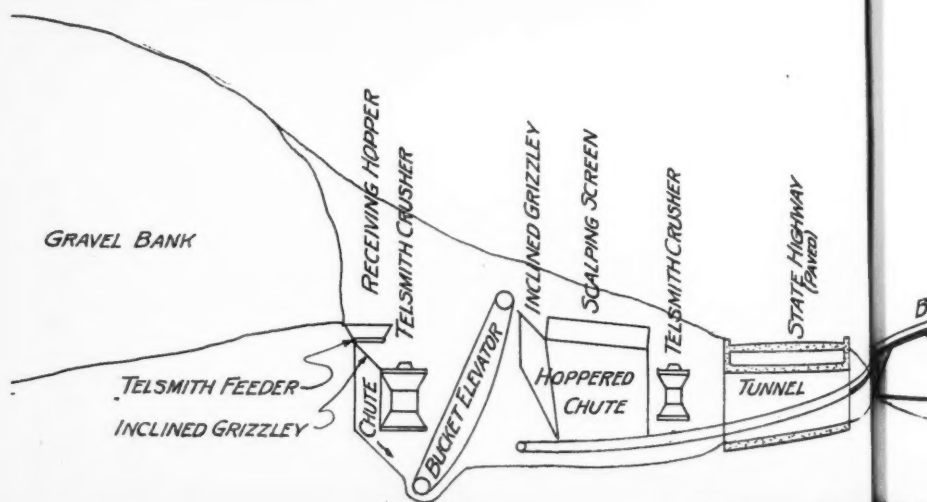
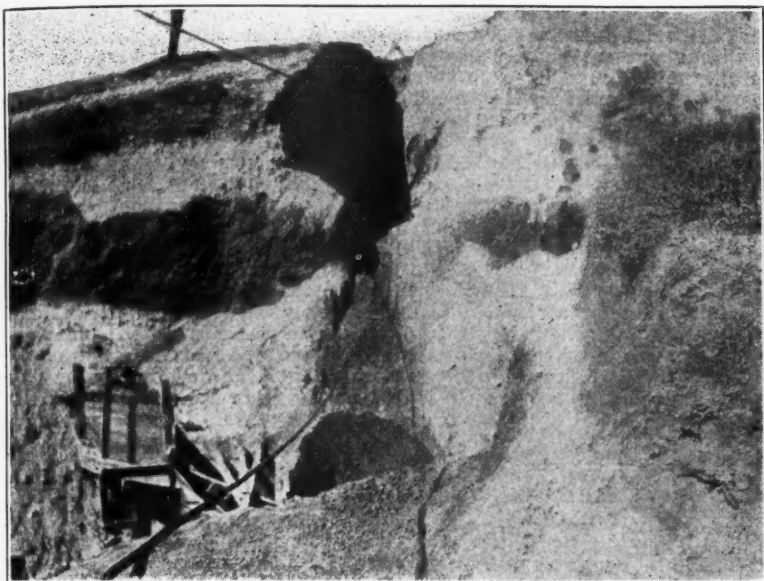


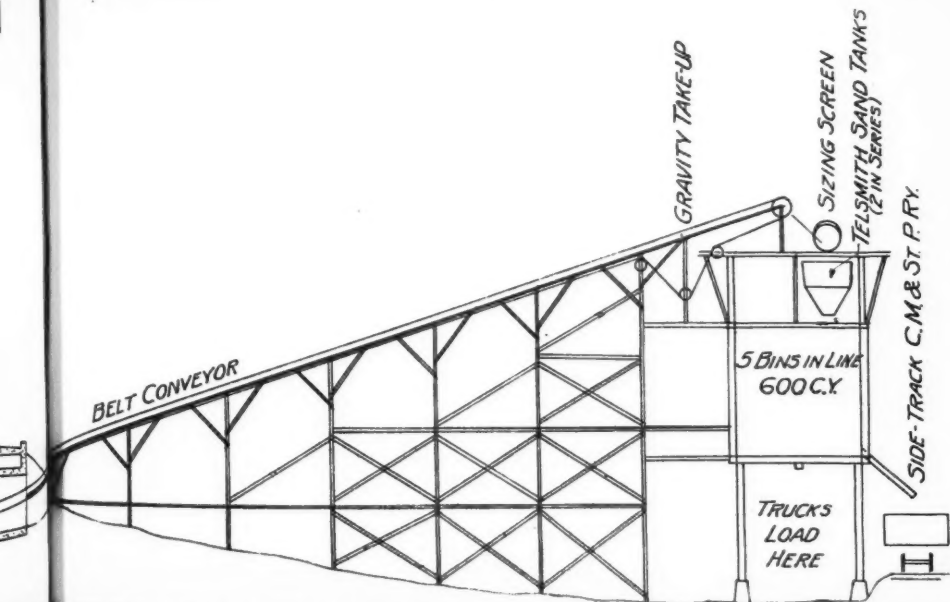
Diagram of Plant



Bottomless Scraper on the Job

one of which was the necessity for generating electric power. No lines carrying the desired voltage and quantity were within reach and the electric company requested an enormous

sum to construct a line to the plant side. Accordingly the Palmer brothers installed a 260 horsepower Buckeye semidiesel engine driving a 300 horsepower Allis-Chalmers 60 cycle 3 phase



Plant S...veyor Tunnel Under Paved Highway

generator producing alternating current at 440 volts pressure. All motors used throughout the plan require 440 volts alternating current so no transformers were required. Alternating current was adopted so that in case a line was constructed at some future time, power could be purchased if desired.

The plant has shown remarkable efficiency as but four men are required besides the Palmer brothers to operate it. P. W. Palmer and his brother, J. E. Palmer, are highly pleased with the performance of the plant. This is generally the case where a thorough study is first made of the deposit, to ascertain all of its possibilities, and the proper machinery required to efficiently produce the desired results before active development is commenced.

Grindstones Make Plant Walls

Worn out grindstones have been used in building a wall several blocks long around two sides of the 65-acre tract occupied by the plant of Henry Disston & Sons, Inc., at Philadelphia. Along a third side which fronts on the Delaware river, is a massive retaining wall also constructed of grindstones. Then, just for good measure, still more grindstones were

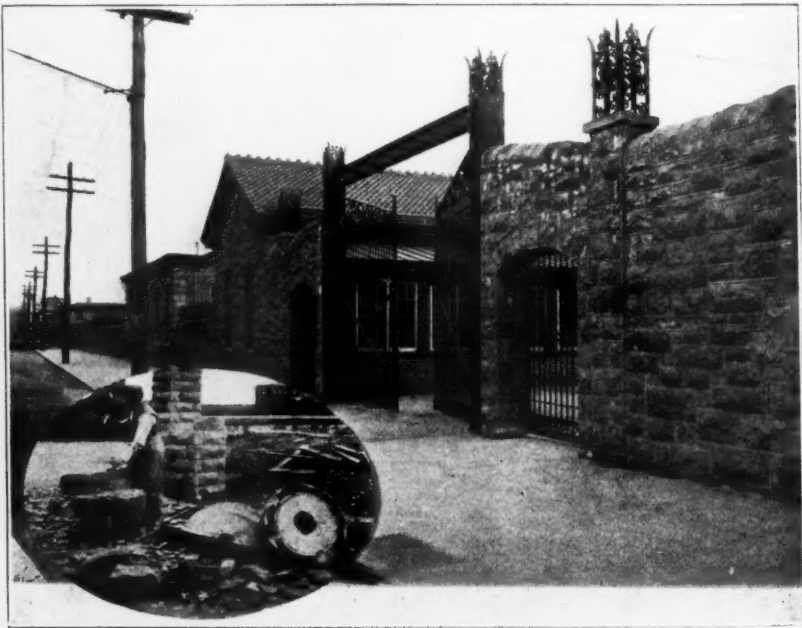
used to build the Tacony Baptist Church, nearby.

All these stones were worn out in grinding saws and other tools in the Disston plant. More than 2,500 of them were used in building the church alone. No record was kept of how many thousands went into the wall around the plant and the retaining wall on the river front, but the total was many times as great as the number used in the church.

In constructing the retaining wall the grindstones were used just as they were discarded from the factory, but for the wall around the plant and for building the church the stones were carefully squared and no one looking at church or wall ever would imagine that they were built of grindstones.

In addition to these walls, grindstones serve as the foundation for roads within the area occupied by the 68 factory buildings that compose the Disston works. At present there are several thousand worn grindstones piled up in the factor yard waiting for some new use.

The Good Roads Machinery Company has appointed K. B. Hubbard, formerly of the Rochester, New York office, as manager of the Chicago office.



Grindstone Wall of Disston Plant; inset, Stones Being Prepared for Wall

Compressed Air and Air Compressors

By C. H. Sonntag

PART I

COMPRESSED air as used in quarry work is an instance of those cases in which a method of power transmission, quite inefficient in itself, is used in spite of that because of its convenience, and because no better way of doing the desired thing has been found. Compressed air is an inefficient means of transporting energy. Before the days of electric central station service there were in operation in Paris and perhaps one or two other European cities large central compressor stations with pipes in the streets to which customers desiring to buy air under pressure could be connected. It was found that the better class of engines in which the air was used for power seldom returned more than 30 per cent of the power originally put into it at the compressor station. With smaller and less efficient engines the recovery was less than 10 per cent. It is doubtful whether these figures would be much improved upon today, but in spite of its apparent wastefulness compressed air is without an equal for certain services, of which those in mining and quarrying are the chief.

Properties of Compressed Air

Air is not a simple or elementary substance, since it is a mechanical mixture of oxygen and nitrogen in the approximate ratio of 21 to 79 by volume, with fractional percentages of water vapor, carbon dioxide and other gases. For the purpose of the present discussion, however, this composition need not be taken into account, and air may be considered to be a simple gas.

Every gas may be liquefied if the temperature is low enough and the pressure sufficiently high. It has been found by experiment, however, that for every gas there is a certain temperature above which no amount of pressure will serve to liquefy it, even though it be compressed to the same volume it would occupy as a liquid. The highest temperature at which liquifaction can occur is called the critical temperature, and the lowest pressure that will produce liquifaction at this temperature is called the critical pressure. These values for oxygen and nitrogen are shown in Table I.



C. H. Sonntag

TABLE I.

	Critical temperature	Critical pressure
Oxygen	-180.4°F.	735 lbs. per sq. in.
Nitrogen	-236.0°F.	515 lbs. per sq. in.

The existence of the critical temperature was first noticed by a Frenchman, Cagniard de la Tour, in 1822. He found that when certain of the more easily liquefied gases were confined under pressure in a glass tube under their own vapors, there was for each gas, as the temperature was raised, a point at which the boundary between the liquid and its vapor disappeared, the contents of the tube becoming gaseous without change of volume.

It has been found that in general the pressure and temperature of gases vary in accordance with certain simple laws which will be presently discussed, but experience shows also that these rules are closely followed only by those gases whose critical temperatures and pressures are far removed from those governing the conditions of the experiment. The figures given above for oxygen and nitrogen show that they meet this condition, so that for the purpose of the present study air may be considered to be a perfect gas.

The Gas Laws

The properties of gases were the subjects of research by a number of the early investigators of physical phenomena, probably because they could be studied with the limited and crude apparatus at their disposal. As a consequence the fundamental facts in this field have been known for many years, and from the basis of the production and use of compressed air and other gases.

Boyle's Law

The first of these facts was discovered by Robert Boyle, an English student of nature, in 1662. He announced in that year his conclusion, based on experiment, that the volume of a gas held at constant temperature would vary inversely as the absolute pressure upon it. This law could not be demonstrated with the apparatus and information at hand at that time unless the experimenter had a knowledge of the pressure of the atmosphere. This had been proven shortly before by an Italian, Torricelli, in 1643, who showed that the ordinary atmospheric pressure is able to support a column of mercury about 30 inches high. The construction of modern barometers is based on his work. Absolute pressure is that measured from the actual zero of pressure, which is roughly 14.7 pounds per square inch less than the atmospheric pressure to which everything on the earth's surface is subjected. Since the ordinary gauge reads zero at atmospheric pressure, absolute pressure may be obtained by adding 14.7 pounds per square inch to the gauge reading.

Boyle's law may be simply expressed by saying that if the pressure on a certain volume of gas be doubled, the volume will be halved, or conversely if the pressure be halved the volume will be doubled, always with the understanding that the temperature remains constant. It may be written mathematically $P_1 V_1 = P_2 V_2$, in which

P_1 is the initial absolute pressure

V_1 is the initial volume

P_2 is the final absolute pressure

V_2 is the final volume

The equation means that at constant temperature the product of the volume and absolute pressure of air or gas is constant. Written in the equivalent form

$$\frac{P_1}{P_2} = \frac{V_2}{V_1}$$

it means that the volume varies inversely as the absolute pressure.

Boyle's law was confirmed, with some additional refinements in procedure, by Marriotte, a Frenchman, in 1676, and is sometimes called by his name.

Charles' Law

It is generally known that when a given volume of gas is heated, the volume increases if the pressure is kept constant. The gas in a balloon will expand and fill the bag in the day-time when warmed by the sun, and will shrink considerably during the cool night, with consequent loss of lifting power.

The expansion of air by heat was first announced as a scientific fact by Charles, a Frenchman, in 1787, but quantitative investigation was first made by John Dalton, an Englishman, and Gay-Lussac, a Frenchman, in 1802, working independently but within a few months of each other. They found that, given a certain volume of any perfect gas at 0° C., it would expand 1/267 of its volume at 0° C. for each degree C. increase in temperature if the pressure were kept constant. Later and more careful research has shown that this fraction should be 1/273 if the temperature is measured in Centigrade degrees.

It follows that if a gas obeyed this law continuously as the temperature is decreased it would have no volume at -273° C. The least condensable gases do follow this law to very low temperatures, and for this and other reasons -273° C. is taken as the absolute zero of temperature. It has been approached within four or five degrees, but never actually reached.

The Fahrenheit degree in common use in this country is 5/9 of a Centigrade degree. The freezing point of water or the melting point of ice is 32° F. and 0° C. There are then 491 Fahrenheit degrees between the freezing point of water and the absolute zero, an interval corresponding to 273 Centigrade degrees. Ordinarily Fahrenheit temperatures may then be converted to the absolute Fahrenheit scale by adding $491 - 32 = 459°$, since the freezing point of water is at 32° F. This is the same as saying that the absolute zero is at -459° F.

This expression of the rate of expansion of air by heat is known as the Law of Charles, or sometimes as the Law of Gay-Lussac. It may be stated mathematically in this way:

$$\frac{V_1}{V_2} = \frac{T_1}{T_2} \text{ or } V_1 T_2 = V_2 T_1$$

where T_1 and T_2 are the initial and final absolute temperatures. These equations mean that at constant pressure the volume of a gas varies directly as the absolute temperature.

If instead of allowing the gas to maintain constant pressure by changing its volume we make the latter constant while applying heat, it will be found that the pressure increases $1/273$ for each degree C. that the temperature is increased above 0° C. Then at 273° C. the pressure of the gas will be doubled, as will also its absolute temperature. It appears then that at constant volume the pressure of a gas varies directly as its absolute temperature, which may be written

$$\frac{P_1}{P_2} = \frac{T_1}{T_2} \text{ or } P_1 T_2 = P_2 T_1$$

Boyle, over a century before, had noted the influence of the temperature on the volume of air, but could not give numerical values to his discoveries because there was no good way to measure temperature at that time.

The laws of Boyle and Charles may be combined into one in this form:

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

This means that if the volume of a given mass of gas or air is multiplied by its pressure and divided by the absolute temperature the quotient will be a constant for any corresponding values of the three measurements. We may call this quotient R , and say that:

$$\frac{P_1 V_1}{T_1} = R$$

but since this applies to any corresponding pressures, volumes and temperatures we may write it in the more general form

$$\frac{PV}{T} = R \text{ or } PV = RT,$$

which is the general gas equation.

Specific Heat at Constant Volume

Suppose that we have a certain volume of gas at a known pressure and temperature, which will have a certain weight in pounds. Let us increase its temperature 1° F. while retaining it in the original space or volume. As the temperature rises the pressure will also increase accord-

ing to the law of Charles, but since the volume is not allowed to change this pressure does no work, for work is measured by the product of a pressure or force and the distance through which it acts, and in this case the distance is zero. The energy supplied in the form of heat then all goes to raise the temperature of the gas. The specific heat of a substance is defined in the units in common use as the amount of heat required to raise the temperature of a pound of that substance 1° F. Many experiments have shown that the specific heat of air under the above condition of constant volume is 0.171 BTU per pound. It is usually denoted by the symbol C_v . (The British Thermal Unit, abbreviated BTU, is the amount of heat required to raise the temperature of one pound of water from 39.1° to 40.1° F.)

Specific Heat at Constant Pressure

Suppose that, as above, we have a certain volume of gas at a known temperature and pressure. Let us raise its temperature 1° F., and at the same time keep its pressure constant by permitting it to expand a sufficient amount, as in a vertical cylinder under a frictionless piston of constant weight, in a balloon against the pressure of the air, or in any other convenient way. It will be found that we must supply more heat than before, for we must furnish enough energy in this form, not only to heat the gas, but also to do the work of moving the weight of the piston a certain distance against gravity or expanding the balloon against the pressure of the air. The added heat may then be considered to be in two parts—the first, that needed to heat the gas at constant volume, or C_v , and the second, the equivalent of the external work done in expanding the gas against a resistance. The sum of the two per pound of gas is called the specific heat at constant pressure, and is denoted by C_p . For air, the value is 0.241 BTU per pound.

Two Kinds of Compression

All of us who have pumped up an automobile tire by hand have noticed that one of the things that gets hot is the pump cylinder. One would at first think that this is due to the friction between the plunger and the cylinder, but it has been shown in many ways that the rise in temperature is caused by the compression of the air. Of course the same thing

occurs in power-driven compressors on a much larger scale, and so all such machines embody some provision for dissipating a portion of this heat and keeping the temperature of the parts low enough for proper lubrication.

Theoretically air may be compressed in two ways, according to whether the heat of compression is all retained in the air or whether it is completely dissipated during compression.

Adiabatic Compression

Suppose that compression is accomplished by a cylinder and piston made of such material that they will neither absorb or transmit heat. At the end of compression the air will retain such heat as is produced, none having been lost. Such compression is called adiabatic, from Greek words meaning "without transference," in this case meaning without transfer of heat. Of course such conditions can not be fully realized in practice, but they are more or less approached in some types of compressors.

As compression proceeds the volume decreases according to Boyle's law, but the temperature increases, causing the air to exert a greater counter-pressure against the piston than it otherwise would. In consequence the expression:

$$\frac{P_1}{P_2} = \frac{V_1}{V_2}$$

must be modified in some way that will take into account the heat retained in the air. It has been found that the equation may be re-written in the form

$$\frac{P_1}{P_2} = \left(\frac{V_2}{V_1} \right)^k$$

where k is the ratio of the specific heat at constant pressure to that at constant volume, or $\frac{C_p}{C_v}$. For air this

.241

ratio is $\frac{.241}{.171}$ or 1.41, so that condi-

tions during the adiabatic compression of air may be expressed by the

$$\frac{P_1}{P_2} = \left(\frac{V_2}{V_1} \right)^{1.41}$$

Isothermal Compression

In contrast to the above state of things suppose that the cylinder and piston are perfectly transparent to heat, so that the latter is dissipated as rapidly as it is developed. The air will then be compressed at constant temperature, and will follow Boyle's law exactly. The process is said to be isothermal, from Greek words meaning "equal heat." Such an ideal state of affairs can not of course exist in any actual machine.

The bearing of these theoretical studies on the results obtained in commercial operation may be best shown

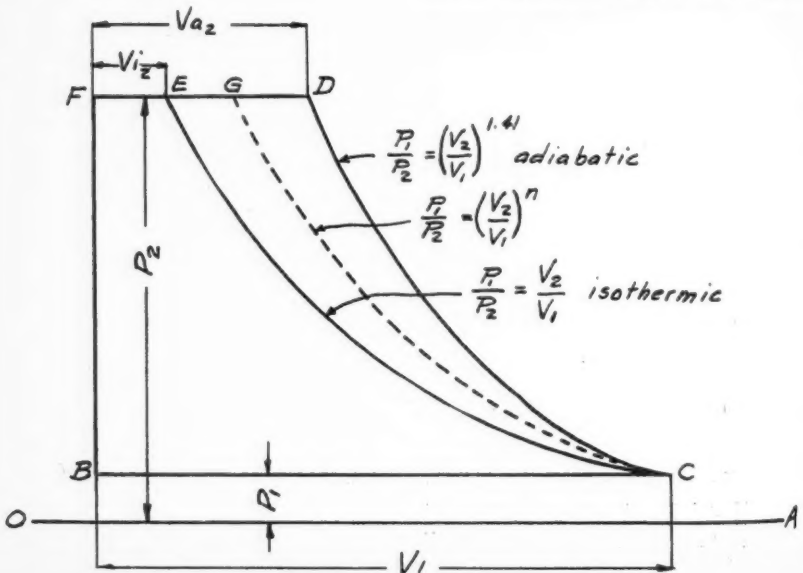


Fig. 1.

with the aid of an elementary indicator diagram, Fig. 1.

In this diagram OA is the vacuum or zero pressure line, BC is at a distance above OA representing the initial pressure P_1 and its length represents the stroke of the piston, while FED is at a distance P_2 from OA corresponding to the discharge pressure.

As the piston moves from C towards B, if compression is isothermic the pressure will increase in the manner shown by the curve CE, while if the process is adiabatic the retained heat will cause the pressure to rise more rapidly, as shown by the curve CD. Every engineer knows that the work done in a cylinder is proportional to the area of the indicator diagram, and it follows that the adiabatic compression of a given volume of free air to a stated pressure requires more power than if compression could be carried out isothermally. This can not be attained in a commercial machine, but where high efficiency is aimed at every opportunity for cooling the air during compression by water-jacketing the cylinder walls and heads is utilized. The result is that compression proceeds along such a curve as CG, and is expressed by

$$\text{the equation } \frac{P_1}{P_2} = \left(\frac{V_2}{V_1} \right)^n$$

where n varies from 1.35 to 1.25. The high value applies to modern high-

speed compressors, while the lower is possible in a slow-speed low pressure machine. It has been found that as a dollars and cents proposition it pays to sacrifice something in the efficiency of the air cylinder for the sake of the lower investment in compressor and floor space obtainable by the use of high-speed machines.

The diagram does not take into consideration cylinder clearance or re-expansion, but serves just as well to illustrate the difference in the two kinds of compression. Table II^a shows the power saving that would be possible if true isothermal expansion could be accomplished. The attainable power consumption will be between the values given for adiabatic and isothermal operation.

(a) Ingersoll-Rand Co., New York.

O. & S. Change Name

The corporate name of Orton & Steinbrenner Company, 608 South Dearborn street, Chicago, with factory at Huntington, Indiana, has been changed to Orton Crane & Shovel Company. No change in the ownership, management or officials is involved; the reason for the change in name being to describe better the company's principal activity which is the manufacture and sale of locomotive cranes, crawling tread cranes, gas, electric and steam shovels, draglines and grab buckets.

TABLE II
Single-Stage Compression—Jacket-Cooling Not Considered

Gauge Pressure Pounds	Absolute Pressure Pounds	Isothermal Compression		Adiabatic Compression	
		Mean Effective Pressure	H.P.	Mean Eff. Pressure Plus 15% Friction	H.P. Plus 15% Friction
50	64.7	21.80	0.095	31.31	0.136
55	69.7	22.95	0.100	33.23	0.145
60	74.7	23.90	0.104	35.10	0.153
65	79.7	24.80	0.108	36.91	0.161
70	84.7	25.70	0.112	38.59	0.168
75	89.7	26.62	0.116	40.25	0.175
80	94.7	27.52	0.120	41.80	0.182
85	99.7	28.21	0.123	43.27	0.189
90	104.7	28.93	0.126	44.71	0.195
95	109.7	29.60	0.129	46.12	0.201
100	114.7	30.30	0.132	47.46	0.207
110	124.7	31.42	0.137	50.09	0.218
120	134.7	32.60	0.142	52.53	0.229

Lime in 1925

The lime sold in the United States in 1925 amounted to 4,510,000 short tons, valued at \$42,530,000, according to estimates furnished by lime manufacturers to the Bureau of Mines, Department of Commerce. These figures show an increase of 11 per cent in quantity and 7 per cent in value over the sales in 1924. The sales of hydrated lime, which are included in these figures, amounted to 1,505,000 tons, valued at \$14,926,000, an increase of 14 per cent in quantity and 13 per cent in value. The average unit value of all lime showed a decrease from \$9.72 a ton in 1924 to \$9.43 in 1925, and that of hydrated lime a decrease from \$10.03 a ton in 1924 to \$9.92 in 1925.

Ohio, the leading State, showed an increase of 13.5 per cent in total sales and 14 per cent in sales of hydrated lime. Pennsylvania, which ranked second, showed an increase of 12.5 per cent in total sales. Of the 22 States in which more than 25,000 tons were sold, only 3 showed decreased sales.

Sales of building lime were about 2,365,000 tons, an increase of 9 per cent. The estimated sales of chemical lime for 1925 were 1,885,000 tons, an

increase of 14 per cent. The dead-burned dolomite reported as sold for refractory is estimated at 375,000 tons compared with 328,659 tons in 1924. The demand for lime for use in agriculture was somewhat better in 1925 than in 1924, and the sales are estimated at 260,000 tons, an increase of 5 per cent.

Link Belt Crawler Booklet

The new All-Purpose Crawler Crane Book No. 895 just issued by the Link-Belt Company, is one of the most complete ever published. The book contains 48 pages, generously illustrated to show the use of the drag-line, dipper and trench shovel, skimmer scoop, hook blocks and pile drivers.

Data on lifting capacities, approximate operating speeds, line pull, tractive effort, etc., are given. The tables in which this data is arranged have been supplemented by line drawings which show dimensions for operating limits.

Information is given on some of the usual, as well as the more ingenious uses to which the various types of cranes can be put.

Lime Sold by the Producers in the United States in 1924 and 1925

State	1924			1925 (estimated)		
	Hydrated lime (Short tons)	Total lime		Hydrated lime (Short tons)	Total lime	
		(Short tons)	Value		(Short tons)	Value
Ohio	654,763	934,407	\$9,511,270	745,000	1,061,000	\$10,664,000
Pennsylvania	189,431	700,431	5,634,806	210,000	788,000	6,434,000
West Virginia	44,841	238,714	1,884,682	52,000	295,000	2,095,000
Missouri	60,651	243,465	2,354,175	74,000	272,000	2,605,000
Wisconsin	18,246	235,030	2,129,701	21,000	243,000	2,146,000
Massachusetts	(a)	194,402	2,693,028	(a)	195,000	2,520,000
Virginia	38,001	172,776	1,409,447	50,000	190,000	1,460,000
Alabama	23,465	204,059	1,812,282	27,000	180,000	1,550,000
Tennessee	44,242	144,292	1,111,781	43,000	177,000	1,315,000
Indiana	44,697	116,927	991,003	43,000	126,000	1,022,000
Maine	(a)	125,688	1,809,929	(a)	117,000	1,600,000
Illinois	(a)	89,132	934,199	(a)	98,000	1,017,000
New York	(a)	98,592	991,799	22,000	94,000	906,000
Michigan	(a)	73,096	702,072	10,000	91,000	874,000
Texas	25,496	60,565	570,334	29,000	70,000	678,000
Vermont	(a)	56,484	710,739	(a)	69,000	741,000
California	(a)	59,583	653,138	13,000	66,000	857,000
Connecticut	(a)	58,851	796,541	(a)	63,000	762,000
Maryland	29,134	56,178	470,105	38,000	59,000	500,000
Arizona	(a)	27,972	331,756	(a)	46,000	460,000
Washington	(a)	28,188	353,450	(a)	29,000	355,000
Minnesota	(a)	25,764	319,066	(a)	(a)	(a)
	143,697	127,455	1,416,120	128,000	121,000	1,972,000
Undistributed	1,316,664	4,072,000	\$39,596,423	1,505,000	4,510,000	\$42,530,000

*Included under "Undistributed."

The Human Element in Plant Operation

By A. B. Mack

Ass't Gen. Mgr. Kelley Island Lime and Transport Co.*

THE success of an organization depends upon the human element from the executive down through the subordinates to the actual workmen. The executive's success or failure depends greatly on the soundness of his policies in dealing with men, and his ability to radiate that policy through the rest of his organization. Many believe that only two factors are necessary to industrial success—capital and labor—but you all know that without good management the capital soon disappears and then there is no need for the labor. I do not mean that a sign on a door is all that is needed for management; it goes deeper than that, for the management must be sound in its policies in dealing with the men as well as in handling the rest of the company's business.

Foremost among the principles necessary to the solution of the problem of human element are Confidence, Justice and Truth. You are all familiar with the fact that the executives of large corporations having varied and scattered interests lost that personal contact with their employees that prevailed prior to the period of consolidation and expansion. It used to be that the management wintered and summered their employees, shared their joys and their sorrows, with the result that there existed a relationship that was invaluable both to the company and to the employees. With the coming of the large corporations the executive, having such a great amount of business to handle, had to depend upon reports—cold things at the best—and on his subordinates for his contact with the employees. Very often the subordinates, either in their zeal for a showing or from selfish motives distorted the facts in their reports, with the result that the opportunity presented itself for the agitator to get in his fine work. However, I believe that the pendulum is on the back swing now and infinite good will be accomplished in the coming years to re-establish a proper relationship.

When I said confidence is one of the essentials, I mean that the employer must have the confidence of his employees, and those subordinates whose duty it is to administer the company's affairs with the employees must gain the confidence of those directly under them. There may be different ways to gain this confidence, but the way to gain it and hold it is by Justice. Remember that you are the judge and jury in the maintenance of a proper relationship between the company and its employees. You need the confidence of your men and you must be fair and just to your company and fair and just to your men in all matters that come up for your decision.

By truth I mean that it is absolutely necessary that truthfulness and honesty be cultivated. Truth is fact, and as a very able man recently said "To take the hazard out of business, get the facts."

You will note that I have placed the burden upon the employer in order to accomplish the proper relationship between employer and employee. The employer, manager or executive is the outstanding personality in any organization and you will not often find the subordinates or employees rising about their superiors in the maintenance of principles. The average of employees has not undergone any great change, contrary to the often expressed idea that you cannot get as good men today as you could years ago. We have found that the workmen of today have just as much pride in accomplishment and good-workmanship as they ever had. This is one of the human element problems that many worry about. To illustrate this, I might mention a plant I knew about that had about 250 men working. The operating head of that plant always blamed his poor showing onto the fact that none of his men were any good. Another man finally took charge and with the same organization except that he reduced the force to less than 175 men, immediately turned the plant from red figures to black figures. Here the human element had failed, but the failure was not with the men, it was with the

*From a paper presented before the ninth annual convention of the National Crushed Stone Association on January 20, 1926.

management. You can spend millions for plant and equipment but you have to get back to the human element for ultimate success.

It is true that it is necessary to properly compensate an employee for his work. The best results are gained when the employee is happy in his environment and free from financial worry. The men are usually fair and it is usually when you have neglected them that they are led to do foolish things.

Intelligent discussion of important problems of wages and working conditions will ordinarily dispose of such matters to the satisfaction of both employer and employees. It is obvious that one man cannot discuss such matters with a mob, and for this reason they should be discussed between the management and a selected committee of the employees, the committee to be selected by the employees and in whom they have the same confidence that the stockholders have in the management.

None of these matters that I have mentioned depend for their success upon the sacrificing of either discipline or efficiency. The sacrificing of either will destroy the confidence of the employees in the management.

One of the very important means by which the principles I have stated may be maintained is the establishment and operation of the seniority rule in filling vacancies and making promotions. You are no doubt all familiar with it but I believe it is a matter that is frequently misunderstood. Seniority puts hope and industry into your men. It takes away from the lesser supervisory men the opportunity to break down your organization by playing favorites or settling grudges. A rule of seniority in its practical operation will get a man a better job, but only that man's own ability will hold it for him. It takes time to get it working properly because individual cases will arise that need special handling, but once in force and practiced as it should be, it will work wonders with one of your very serious problems—labor turnover.

All of these things I have talked about are practical—they are practiced in what we take pride in believing is a successful organization. You all have ideas that you have worked out and I am sure we can all profit by hearing about them from you.

Haiss Traction For Fordson

The Haiss Traxion Chassis for the Fordson has been brought out by the George Haiss Manufacturing Company. The manufacturers claim it combines Fordson economy with the pulling power and sure traction of the Haiss creeper tread mounting and the machine is especially adapted for heavy duty work including excavating, heavy hauling, road building, grading and ditching.

The Traxion Chassis is of all steel construction. The frame is of 7 inch channel members hot riveted and rigidly braced. Three points suspension relieves the frame and power plant of all strains. A heavy 13 leaf spring in the front cross member absorbs shocks and jars. A Baldwin roller chain drive is used.

The machine has double creeper belts of the heavy duty type. Each consists of a structural steel frame with sprocket at one end and idler at the other with three carrying rollers between and a chain tread. The tread plates are electric steel castings of an overlapping solid faced design and are driven through the link pin housing. The rear end of the creeper unit is carried on the drive axle and is connected by an equalizing spring member.

The drive is by sprockets which key on the rear axle in place of Fordson wheels, by roller chain to sprockets on the creeper rear axle. The machine has a draw bar pull of 15 h.p.

New Mundy Automatic Brake

G. L. Dilly, chief engineer of the J. S. Mundy Hoisting Engine Company, has just announced the design of the new automatic brake, which is to be built on all future gasoline and electrically driven hoists made by the concern. This brake consists of a rim wheel keyed on the intermediate shaft of the hoist, upon which an asbestos lined brake is mounted.

The differential spool and spring mechanism shown in the photograph causes the brake to grip the wheel so that it is impossible for the load to descend or the drum shaft to reverse. Under test the brake held the rated load without slipping. When the rim wheel is revolving in the hoisting direction, the automatic brake idles.

The gasoline hoist upon which this brake was mounted was run continuously for two and one-half hours. During that time there was no heating of the brake.



“Hercules” (Red Strand) Wire Rope

The Wire Rope with the Service Record

Let results determine the real value of the wire rope you use. Put on a “Hercules” line and keep a record of its performance. Try it on your hardest work. You will find it dependable and economical. It will also keep your entire equipment on a more efficient basis.

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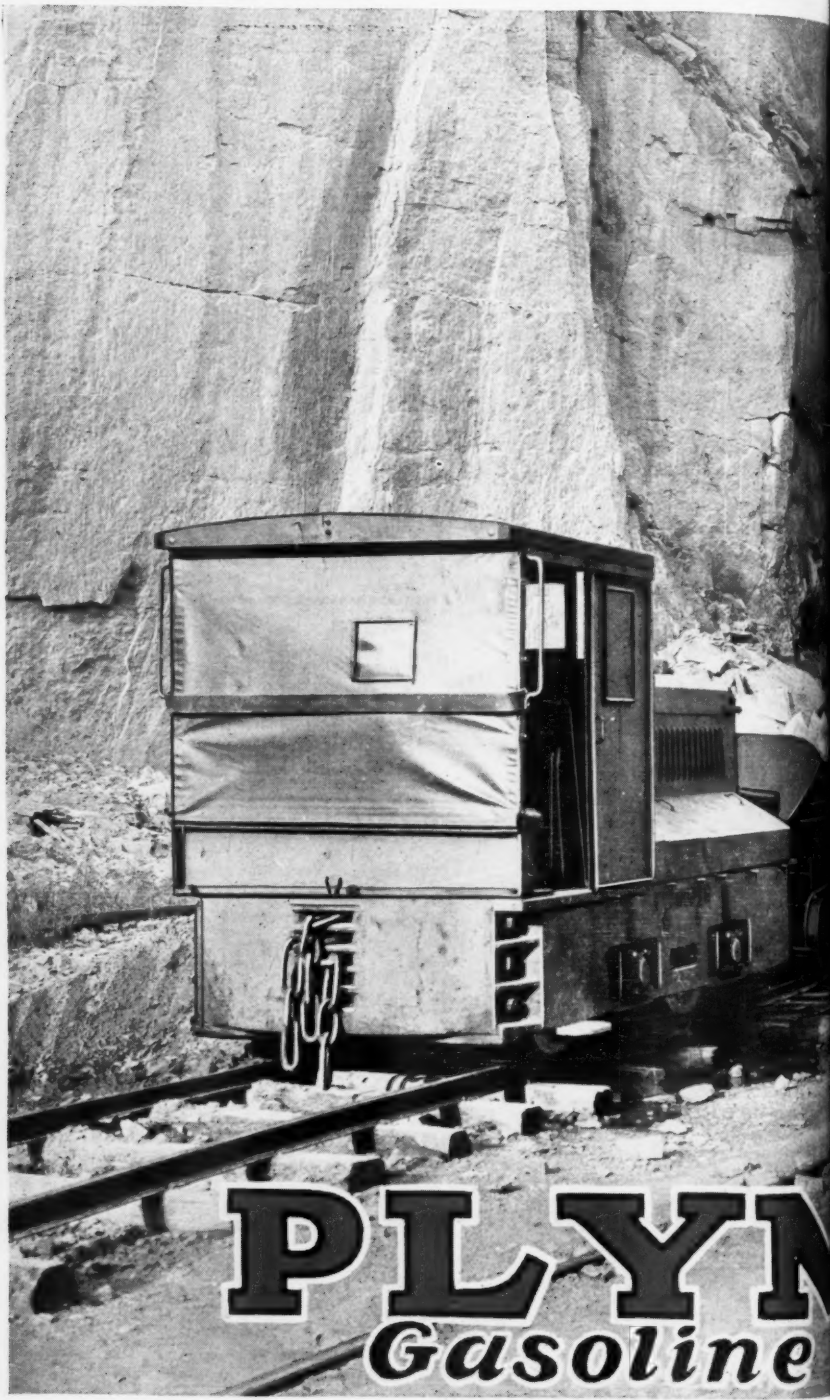
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PLYMOUTH
Gasoline

Plymouth Displaces Three Men

The American Lime and Stone Company (Warner-American Industries) is one of the really big lime and stone industries of the country.

Seven Plymouth Locomotives are used at their various plants. The view below shows an 8-ton Plymouth at their Bellefonte, Pa. quarry.

Mr. Samuel M. Shallcross, Vice Pres. and Gen. Mgr. writes:

"We formerly had three locomotives working in this quarry, but since we installed the eight ton Plymouth we have been able to eliminate one of them so that we now have but two locomotives operating. This represents a saving of three men, as well as the operating charges on the steam locomotive."

Plymouths are made in 3 to 20 ton sizes.

Write for Catalog and
Bulletins "C" and "F"

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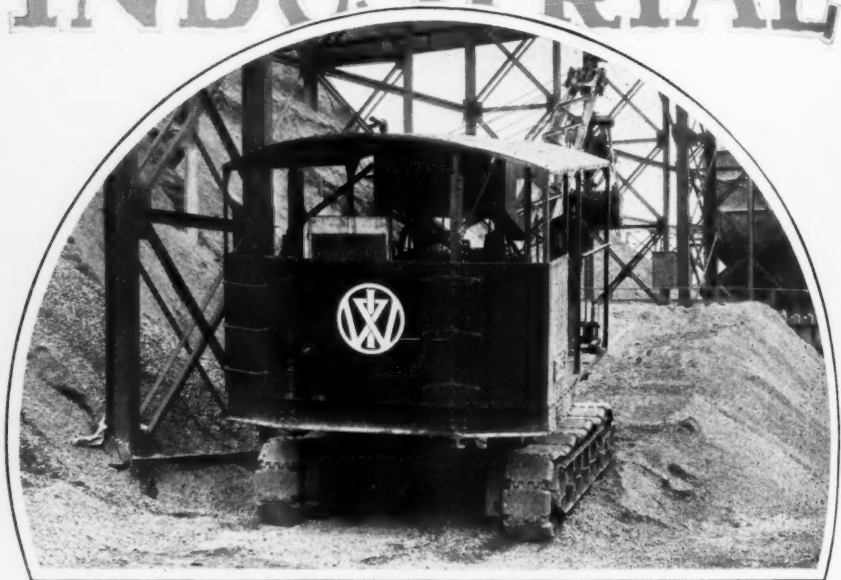
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WHEN you put an INDUSTRIAL crawling tractor crane on the job, it goes to work at once, piling up the profits.

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This type DC is a crane, shovel and dragline. Think of buying three machines for but slightly more than the price of any one of other make!

May we send you further details?

INDUSTRIAL WORKS · BAY CITY · MICHIGAN



An Efficient Material Handling System Keynote to Service in This Instance

STARTING on March 10th of 1923 with a half yard Sauerman scraper excavating and stripping for a sand and gravel deposit, and developing a business which has grown until today this one-half yard Sauerman scraper has been replaced by a Sauerman 1½ yard scraper because the market demand required production of 600 yards of material per day, shows rapid development. This growth was experienced by a sand and gravel operation near Schenectady, New York, owned by Neal F. Ryan. The development and management of this plant has been under the direct supervision of G. N. Dulin, engineer and manager, who had the initial plant ready for operation in seven months. The sand and gravel plant is located in Scotia, New York, across the Mohawk River. A brick plaster and asphalt sand plant is also operated by the same organization in Schenectady, N. Y., with a capacity of 300 yards per day.

At the present time a Sauerman 1½ yard scraper operated by a Sauerman double drum two-speed hoist which is driven by a 75 h.p. General Electric A. C. motor hauls material into the plant. The present scraper operates over a 300 foot span and discharges the material hauled into a field hopper with a capacity of 8 cubic yards. Material is fed from this field hopper by a 30 inch by 6 foot Stephens-Adamson feeder to a 24 inch by 160 foot Stephens-Adamson belt conveyor which in turn discharges to the scalping screen 42 inches in diameter and 12 feet in length. This scalping screen is equipped with a dust jacket 60 inches in diameter and 7 feet in length.

A 10 inch Allis-Chalmers and a 6 inch special reduction Allis-Chalmers crusher handle the product from the scalping screen. The 10 inch crusher is driven by a 50 h.p. General Electric motor while the 6 inch crusher is driven by a 40 h.p. of the same make. Both of these crushers discharge to a 24 inch by 20 foot Stephens-Adamson belt conveyor which in turn discharges to the foot of the 16 inch by 60 foot centers Stephens-Adamson bucket elevator. The conveyor belting is Goodyear throughout the plant. This bucket elevator lifts the material to the head box feeding to the right at the top of the plant. The feed from this box is by gravity to the 42 inch by 20 foot Stephens-Adamson cylindrical screens. Four sizes of stone are produced in this screen: ½, ¾, 1½ and 2 inches. These sizes are discharged directly to separate bins with a total capacity of 200 yards. The rejects from this screen are returned to the 6 inch reduction crusher. The ¾ inch product which is discharged from the first 6 foot section of the screen passes over a 3 by 8 foot Universal vibrating screen with ⅜ inch square mesh, driven by a one h.p. motor at 1,800 r.p.m. This screen sizes the material from ⅜ to ½ inch. The dust from the Universal screen is elevated and joined with the sand and water as it enters the wash box.

The material from inch gravity to sand, as it comes from the scalping screen, passes by gravity to a 16 inch 60 foot centers Stephens-Adamson bucket elevator which lifts it to the head box feeding to the left at the top of the plant. This elevator is



View Looking at the Plant From One End of the Deposit



An Excellent View of the Plant Pit

parallel to the crushed stone elevator which feeds to the right. The sand and gravel passes from the head box by gravity to a 42 inch by 10 foot Stephens-Adamson cylindrical square wire mesh screen with $\frac{1}{8}$ openings. A stream of water piped 300 feet through a 4 inch line is added in the head box and washes the sand and gravel in its path to the screen. Another stream of water is added as the material strikes the screen. A perforated pipe running the length of the screen on the inside provides a final

rinsing. The sand and water drop to a 4 by 18 foot Good Roads wash box for final separation. The sand and gravel is discharged directly to storage bins. There are three bins for this storage. One is for one inch gravel, another is for concrete sand while the third is for sand and gravel mixed. These bins have a combined capacity of 150 yards.

The total bin storage has a capacity of 350 yards. They are 55 feet long and 24 feet in height from the bin floor and 36 feet from the ground. A



The Discharge of the Scraper and the Conveyor to the Plant



Outside Storage System

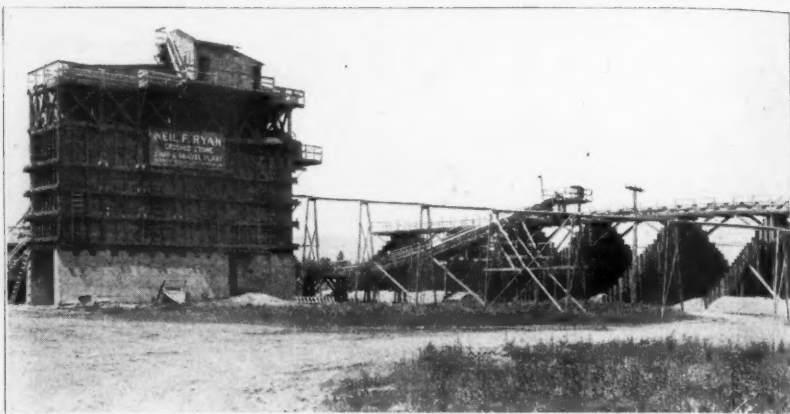
concrete driveway under the bins permits easy access and facilitates loading. Stairways and runways to every part of these bins and also to every part of the crushing and screening plant are a feature which gives easy access. The inside width of these bins is 12 feet 6 inches. Each of these bins is equipped with Stephens-Adamson 12 by 18 inch duplex cut-off gates for loading trucks.

This bin storage is supplemented by an outside storage system which has a capacity of about 10,000 yards.

A storage conveyor 165 feet long and 18 inches wide carries the material from the plant and elevates it a height of 32 feet to a head box which in turn feeds an 85 foot reversible shuttle conveyor 18 inches wide mounted on a track. This shuttle conveyor distributes the material to any one of seven storage sections. This material is reclaimed from storage to trucks by two Haiss loaders with a caterpillar propeller feed of a yard a minute capacity. A Universal truck crane is sometimes used in this service. The Uni-



Belt Conveyor to the Storage Distributing System



The Storage Bins

versal machine however is generally kept busy moving from one stock pile to another and for loading railway cars at the railroad which is some distance from the plant. Only a small portion of the production is shipped by rail.

A fleet of 30 trucks handles the distribution of the product. Twenty-two of these trucks are equipped with Heil dump bodies. Twelve of the trucks are Macks, two of which are 5 yard, seven 4 yard and three 3 yard. Eight of the others are one ton Fords. There is one 2 yard Seldon roadmaster.

This company has built a reputation during its short period of operation for rendering service both as to delivery and a well graded and washed product meeting all requirements. A very attractive piece of advertising literature distributed by this company

came to our attention in which the necessity of using a washed product was excellently presented.

George Haiss Dies

George Haiss, president of the George Haiss Manufacturing Company, New York, died of apoplexy, January 11, 1926. He was born at Bethel, New York, April 22, 1859. In 1892 Mr. Haiss organized the George Haiss Manufacturing Company, builders of material handling machinery. Among Mr. Haiss' better known inventions and patents are clam shell buckets, coal hoisting towers, continuous elevator and bucket conveyors, belt conveyors, and truck loaders. He was also president of the Haiss Realty Company, New York. He is survived by his widow, three sons and a daughter.



The Trucks Lined Up for Parade

Insurance Against Windstorm

By Dwight Ingram

THERE was a certain merchant in our town who had a reputation of having a fire every season that his business was unprofitable. In fact, his record had become so well known that no good insurance company would give him a dollar's worth of protection. One day a young insurance agent, ignorant of the community, called on this man and offered to sell him windstorm insurance. The merchant, getting over his surprise that anyone would want to sell him insurance of any kind, finally stammered:

"My boy, what do I need of windstorm insurance? How could I start a cyclone?"

Yes, windstorm insurance, or as it sometimes is called, tornado insurance, is useless to the unmoral man who tries to "sell out to the insurance company" when times are bad. But next to fire and liability, it is the most important item in a manufacturer's or producer's insurance problem.

It does not take a long memory to recall the heavy storm that swept southern Illinois and Indiana last March, killing 800 persons and damaging property to the extent of \$11,000,000. Nor is it hard to recall the tornado of June, 1924, which caused a property damage of \$13,000,000, centering around Sandusky and Lorain, Ohio.

But these striking tragedies do not constitute the vital argument in favor of insuring against wind damage. The figures on recent storms indicate that the entire United States is "tornado territory" and every month may be a "tornado month." During the past nine years there have been recorded 752 tornadoes in the United States causing a property damage of \$92,000,000 and a loss of life of 2,242. The year 1924 was the outstanding tornado year with 124 tornadoes, causing property damage of \$29,875,000, 313 deaths and 1,424 injuries to persons. June was the big storm month with \$14,000,000 of damage; April being next with \$5,000,000; July \$4,000,000; March, \$3,000,000; May, \$1,500,000, and so on down the calendar. April led in number of tornadoes with 32; May was second with 24. Kansas had the greatest number of tornadoes during the year with 17, Georgia was

second with 12, Alabama third with 11 and Wisconsin fourth with 9.

On industrial property windstorm insurance is almost as universally carried as fire insurance. It is needed because no community is exempt from the risk of severe winds and because such catastrophes are purely "acts of God" that are beyond human control. Then, too, tornadoes have some peculiarities that are terrifying. The Illinois storm of last March would leap from the ground and travel miles above the earth, then dip down and for a width of two or three farms would scoop everything ahead of it. Whether tornadoes come to a particular community or strike a given spot within their path is a matter of blind chance. It is for that reason that banks are almost always requiring windstorm insurance as well as fire to protect mortgages and loans over which they have control.

The buying of windstorm insurance has taken a tremendous jump this year because the insurance companies have just devised a substantial improvement in the policy form. In the past there was often a gap between the fire and wind policies in such a manner that a building that was visited by wind and fire in succession was not insured at all. This arose in the innumerable cases where wind tore off a corner of a roof or wall, causing a short circuit in electric wires or upsetting a stove, and it was the resulting fire that really destroyed the greater part of the building. In such a case the windstorm policy did not cover the loss because the major damage was done by fire and not by the wind directly. Nor did the fire policies cover, because they contain a clause that "if the building or any part thereof (such as part of the roof or wall) shall fall, except as the result of fire, all insurance shall immediately cease." This gap between the two policies caused constant friction. The policy holders felt that they had paid for protection against damage from any cause; yet the policies very clearly did not cover this risk. So at the annual conference of insurance company executives this year it was agreed that the "fire-tornado gap" would have to be bridged.

It was felt impractical to make any

change in the fire insurance policy, because this is a standard form of contract, every word of which has been interpreted by various supreme courts so that its exact meaning is established and tampering with it might unsettle some other clauses in the policy. The windstorm policy, however, being newer, is still in process of revision, and is being improved in other ways as well. The insurance companies therefore decided to add to the windstorm policies, without any additional charge, a clause stating that if wind damaged a building at all and fire resulted, the windstorm policy would cover the consequent fire loss as well as the direct wind damage. It thus works out that a firm really does not have complete fire insurance without the addition of a windstorm policy.

Until recently windstorm insurance has been misunderstood by many business men because it used to be called tornado insurance. Now it is true that every state might have a tornado but many producers like to believe that no such storm could ever hit their plant. But windstorm insurance covers not only the spectacular total loss. It also covers the partial damage that comes from severe winds which may not be strong enough to be called tornadoes. The actual insurance is against damage from any wind of "more than ordinary intensity," which phrase can be stretched to cover the simple blowing down of a sign or shutter.

As in the case of every kind of accident, winds do damage of two sorts. The direct destruction which they do is obvious. But just as real is the intangible loss resulting from the interruption of business. That is, if a producer's plant is destroyed, the profits for the coming season are gone, and the overhead expense of executives, office help and foremen goes on, for these people must be kept on the pay roll in order to keep the organization intact. This loss of overhead expense and profits during the period of re-establishing business after a disaster is probably greater than the direct property damage in the non-metallic industries. For while it is bad enough to have to rebuild buildings and buy new machinery, it might be impossible to keep an organization intact and continue profits to the stockholders during the dreary period of rebuilding. Linked to the seriousness of the business interruption loss in our particular industries is the second fact that most tornadoes,

and most high winds of other degrees, come during the months from March to July. Now the destruction of the average non-metallic producer's plant in November, for instance, would not be ruinous. The ordinary windstorm insurance money would pay for rebuilding the plant, and the work could be done largely before the spring producing season opened. But if wind should destroy the plant in the spring, the whole year's business would be lost, because the rebuilding would have to be done during the height of the operating season. It is a peculiarity of our industries, therefore, that the worst time of the year for a storm is the very season when high winds are most frequent. And so it would seem that business interruption insurance against windstorms should be a vital part of every producer's insurance program.

The rates for windstorm insurance are generally lower than for fire insurance. And also the rating system or schedule is simple as compared to the complicated analysis of construction and use of buildings that are made in computing fire insurance rates. So far underwriters have only been able to distinguish a few classes in going over their loss records, with the result that the rating schedule is merely a list of rates for each class of building according to its loss experience. In speaking of the rates and rules we usually refer to those applying in the middle west, because the insurance practices there are typical of the entire country and the losses are so many that no other large section of the country has higher rates.

To give a clear estimate of the cost of windstorm insurance to those few readers who are not carrying it, we quote the following rates on certain important classes in the middle western rating schedule

Ordinary industrial buildings, used as offices and shops, that are not of superior wind-resistive construction—annual rate per \$100 of insurance.....	\$.20
Industrial or office buildings of wind-resistive construction (this class includes all re-inforced concrete or skeleton steel fire-proof buildings. The rating bureau in most states will also class as wind-resistive any other building that is especially well designed to withstand wind—rate .....	.12
Private dwellings, flats, private stables and garages—rate....	.16

Covered bridges—rate.....	.80
Elevated tanks which are not on the roof of a building (tanks on a roof are a part of the building underneath them and are so insured)—rate.....	.80
Metal smoke stacks, when insured separately and not included in general insurance on an entire building—rate.....	2.00

Most policies of windstorm insurance are not written on an annual basis, but are written for a period of three or five years at a time. The rate for three years is two and one-half times the rate for one year, and the rate for five years is four times the annual figure, so that insurance for the longer terms is distinctly cheaper.

A vital factor in the buying of windstorm insurance is to decide how much to carry. The basis of loss adjustment is just the same as in fire insurance, that is, the "actual value" of the property. Actual value in insurance means simply the replacement cost, new, at today's market prices (regardless of original cost) minus depreciation or wear and tear for the time the property has been in use. The very conservative property owner, then, would determine what the actual value of his plant is, either through an appraisal or through checking over his bills for buildings and equipment, and then would insure that entire amount on the theory that it is possible for a tornado to wipe out a property completely. It is usually reasonable, however, to count on some salvage after a heavy wind. It probably is not really safe to carry insurance of less than 80 per cent of the actual value, because, since the wind policy is covering not only direct damage but also resulting fire damage, the windstorm insurance ought to be equal in amount to the fire insurance and placed in the same insurance companies so that there can be no ground for dispute as to which company shall pay any loss that may come out of a combined fire and wind. There are some buildings and some communities for which less insurance, maybe as little as 50 per cent of the actual value, is reasonably adequate, but before a producer decides to economize by reducing his insurance, he should go over his individual situation with an insurance engineer.

The question of how much insurance to carry is, of course, linked

up with the co-insurance clause. At the rates quoted above it is not necessary to have any coinsurance. It would be permissible, so far as the insurance company is concerned, to carry only \$1,000 of insurance on a building worth \$15,000, for instance. But the intelligent business man is going to analyze his needs thoroughly regardless of what the policy may require. And when he finds that he ought to carry insurance up to 80 or 50 per cent of the value of his plant in order to get good protection, he will be told that if he will permit the insertion of a clause in his policies stipulating that he is to carry insurance equal to at least the agreed percentage (80 per cent, for example) or will bear a proportionate part of any loss himself if he fails to do so, he will be given a credit in his rate. That is the intent of the co-insurance clause. All of the above rates (except the second one, on fireproof buildings and the third one, on dwellings, etc.) are reduced 30 per cent if insurance up to at least half the value of the property is agreed to be carried; and they are reduced by 50 per cent if an 80 per cent of value agreement is made. The second class, buildings of fireproof or special wind-resistive construction, are allowed credits of 60 and 67½ per cent respectively for the 50 and 80 per cent coinsurance clauses.

Coinurance is misunderstood by so many householders who are not business men that its use for private dwelling insurance is impractical.

Similar to the gap between the old fire and windstorm policies, there is also a weakness in the practical handling of wind insurance on account of hail. It is easy to understand in theory the difference between damage that is done directly by wind and damage that is done by hail stones, which sometimes are impelled by wind. Hail damage to buildings or machinery is not included under the policy unless an additional premium is paid at the rate, usually, of ten cents per \$100 on the full amount of windstorm insurance carried. It is probable that the insurance companies will voluntarily reduce this charge within a year or two. In the meantime it is hard to advise a producer to add the hail feature to his policy for two reasons. In the first place the charge is too high for the risk, and the damage by hail is usually not great in terms of dollars anyway. And in the second place, so many

losses arise where it is impossible for either the producer or the adjuster to decide how much damage was done by hail and how much by wind, that insurance companies frequently have to pay for the hail damage whether they have charged for it or not.

In spite of its popularity, wind-storm insurance lags away behind fire, liability, and even earthquake and flood insurance in the matter of scientific study to prevent loss or damage. Tornadoes and high winds are very much a matter of sheer luck, and it has been found that buildings even of a strong type of construction can be wiped flat by the irresistible force of the elements. While it is hard to get technical assistance, though, the matter of prevention of wind damage is so important that it should be considered by each producer individually. It will often be found that relocation of certain buildings will minimize the chance of their being struck by wind. Then, too, all permanent buildings should be constructed substantially, especially with walls or frame capable of resisting a wind of maximum known velocity. And finally much inconvenience and loss of time will be avoided if the producer eliminates as far as possible from his plant elevated tanks, roof structures, flimsy sheds and other small but important units that would be bowled over by a comparatively moderate wind. Through an intelligent program of preventive planning and of buying insurance correctly, any producer can safeguard himself against loss of his business due to wind or tornado damage.

Plymouth Expand Chicago Office

Mr. Roy M. Nelson is now representing The Fate-Root-Heath Company, manufacturers of the Plymouth gasoline locomotives in the Chicago territory. Mr. Nelson's office is in the Peoples Gas Building, Chicago, with Mr. R. N. Lowry, who will continue to represent the Plymouth Locomotive in this territory, but will devote his time exclusively to the construction and contracting field, while Mr. Nelson will be concerned with the pit and quarry field.

Owing to the rapid strides which the Plymouth Locomotive builders have made in adding a number of heavy models, it has been deemed necessary to increase the sales organization to take care of the broadening market.

Milwaukee Locomotive Catalog

The Milwaukee Locomotive Manufacturing Company has recently issued a new catalog, number 145, describing its complete line of gasoline locomotives built in sizes from 4½ to 18 tons. The catalog is generously illustrated and gives the prospective purchaser ample data from which he can judge the adaptability of the unit to his operation.

The manufacturers point out that their product represents more than eighteen years constant effort and experience in the development and perfection of gasoline motive power for track haulage. Their new type "H," the company claims, sets a new standard in both design and construction, providing greater flexibility in power and speed and the utmost haulage economy. Many noteworthy improvements are incorporated in the new design. The manufacturer believes that the new product will be especially economical and practical around stone quarries, sand and gravel pits, cement works, road building operations and mines.

The larger models are adapted for switching and spotting of freight cars and are now being extensively used for that purpose. The specifications embody the same high quality which has marked these locomotives in the past.

All type "H" locomotives are built on the same design and the eight sizes extend over various gauges of track from 18 to 56½ inches. All have inside wheels, which the manufacturer claims has a distinct advantage over outside wheel construction. The frame which is the foundation of the power unit is of exceptionally rigid and sturdy construction. All type "H" locomotives up to and including the 12 ton size have semi-steel side frames with reinforced channel iron and sills. The larger sizes have cast steel side frames with reinforced channel iron end sills.

The frame bolts are made of medium carbon steel and machined to close limits. All draw pocket castings are made of cast steel and are so designed as to prevent the locomotive from binding on the cars when rounding sharp curves. The frames are designed with the center of gravity extremely low which lessens the tendency toward pitching and rocking.

Producing Talc at Waterbury Vermont

By F. A. Westbrook.

THE Eastern Magnesia Talc Company has an interesting talc mine and mill at Waterbury, Vermont, which differs considerably from the same company's operation at Rochester, which were described in the December 1st, 1925, Pit and Quarry. At Rochester the company operates a shaft mine, but at Waterbury it has an adit mine. The mill at Waterbury is located at the end of the adit, in fact the ore is brought directly into the top of the mill without coming out from under cover at all.

The Mine

The adit has been run at a slight upward angle into a vein of talc between two block walls. It is now about 2,700 feet long. There are stopes about every 100 feet. These are 8x10 feet in size, or larger depending on considerations of safety. Sometimes they are as much as 200 feet high. The angle of the stopes is about 45 degrees or enough for the loosened talc to slide down to the bottom. In some cases the stopes have branches. In addition to this there are horizontal cross-cuts from the main adit and these also have stopes running off from them.

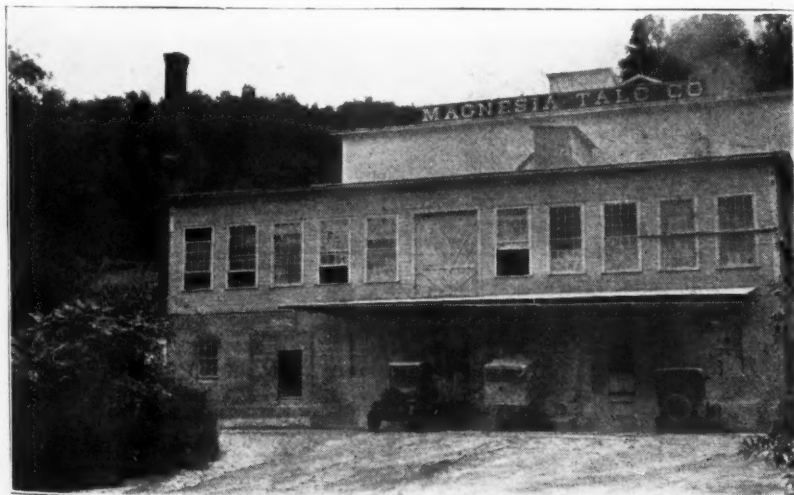
A new tunnel is being made through one of the black rock walls parallel to the main adit for a distance of about 300 feet. This may be extended somewhat further later on but

in any event the end will be connected with the present adit. The reason for making this new tunnel is that the roof of the corresponding portion of the old adit shows signs of sinking and is therefore approaching the danger point. As soon as the new work is completed the old adit will be caved and the talc taken out through cross-cuts through the black rock. The vein talc of this mine is not very safe and most of the adit and the cross-cuts are fully timbered as are the bottoms of the stopes.

Blasting is done with 40 per cent dynamite. The loose material, sometimes broken up by secondary blasting, is allowed to slide to the bottom of the stopes each of which is provided with a door and lever for loading dump cars.

The main adit and cross cuts have tracks for dump cars of about 1.1 tons capacity which are hauled by an Atlas storage battery locomotive equipped with 80 Edison cells. The grade of the adit is slightly upward into the mountain, so that it favors the hauling of loaded cars downward to the mill. The locomotive is capable of pulling about eight empty cars into the mine.

The mine is electrically lighted and the slope to the mill makes it possible for the cars, loaded with the men, to find their way out by coasting, if



Front of Mill Showing Loading



Dump Cars Over Grizzly; Large Pieces Are Broken By Hammers

all lights should fail.

This mine is provided with a ventilating shaft leading to the surface from near the inner end of the main adit. This has been felt necessary on account of its increasing length.

Another peculiarity of this mine is that it does not require pumping because water has no place to accumulate to any extent but runs out of the main adit.

The Mill

Ore, as already explained, is brought in cars directly to the top of the mill from the adit. These cars, one at a time are run over the storage bins. There is a sort of heavy wooden grizzly at this point and any pieces

which are too large to pass through it are broken up by sledge hammers.

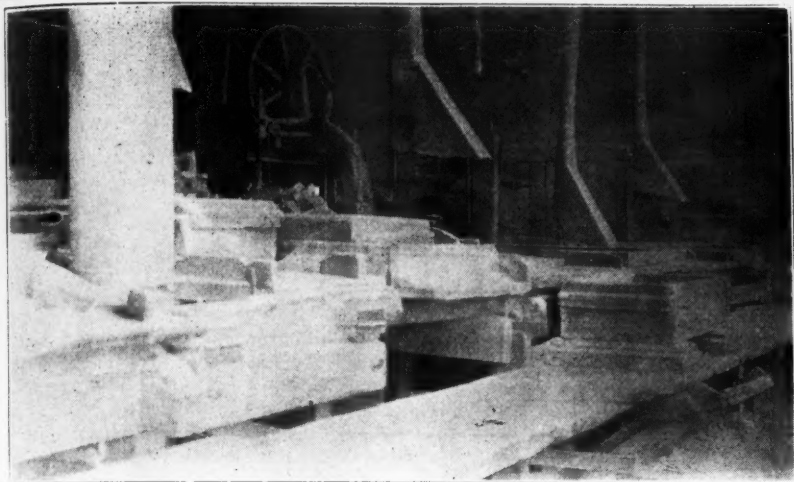
The manner in which the bulk of the material is handled is shown on the accompanying flow sheet, which indicates the type and make of all the machines. It will be noted that the same general plan of reducing the handling, or labor cost to minimum, by a highly developed system of conveyors and elevators has been followed as at the Rochester mill.

Making Crayons

The products of this mill include crayons which are used for marking metals, such as iron, steel, brass, etc. The vein talc obtained from this mine is extremely well suited for this pur-



Dumping Ore from Car Over Grizzly



Crayon Making Dept. Showing Band Saws and Circular Saws at Benches

pose. Quarry blocks of suitable shape are taken to the crayon department, located adjacent to the point where the mine cars are dumped over the storage bins. The selected pieces of talc are passed into a box, or bin, through a chute from which they are taken as wanted.

The first operation in making the crayons is to square up the blocks by means of an ordinary band, or jig saw; they are next cut to size by 12-inch circular saws. Three sizes are made— $5 \times 1\frac{1}{4} \times \frac{1}{4}$ inches $5 \times \frac{3}{2} \times \frac{3}{2}$ inches and round $5 \times \frac{1}{4}$ inch crayons. The second of these sizes is used for turning the round crayons. The illustra-

tions show the band saw and part of the benches equipped with circular saws and exhaust hoods for carrying off dust.

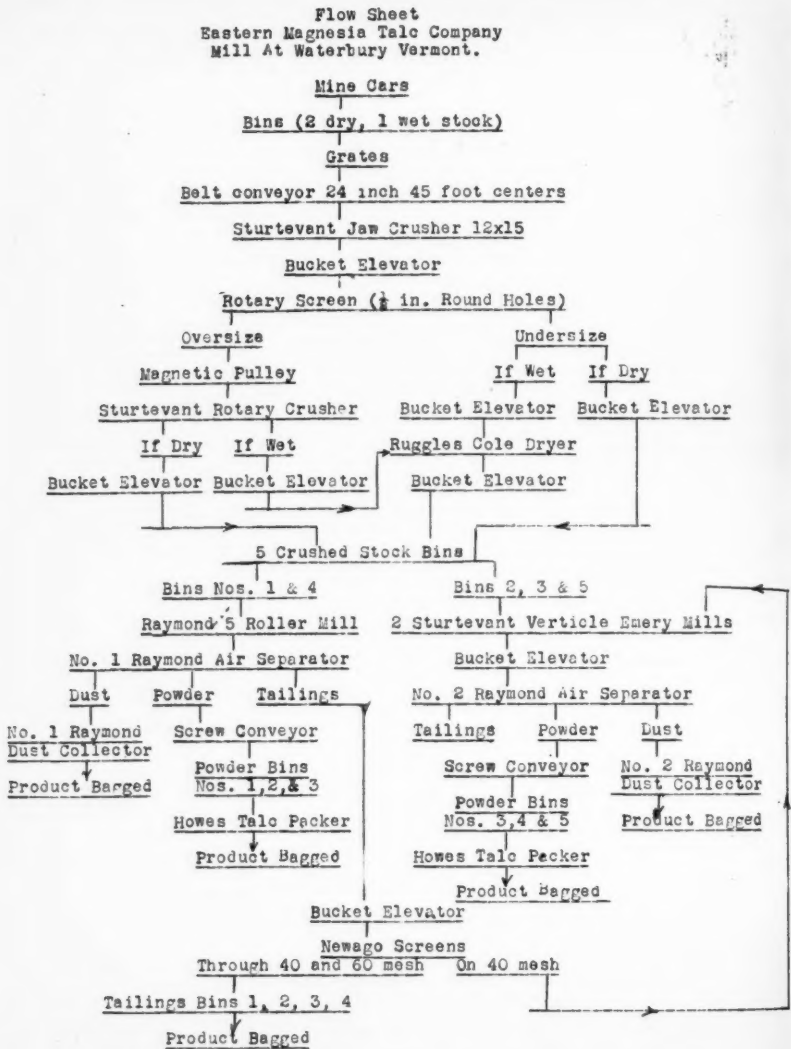
Shipping Department

The shipping department is located adjacent to the bagging machines so that the bags may be placed on four wheeled hand trucks and taken directly to the trucks. The crayons, which are packed in boxes, come down to this point in a chute.

The material is placed in both bur-lap and paper bags and the choice of container is largely decided by the desires of the consignee. The rubber companies which are large users of



Truck at Loading Platform



fine talc specify bags. The paper manufacturers specify both ways. The comparatively coarse rejections from the air separators which are used for roofing are always placed in burlap bags. Evidently there is an opportunity here for some appropriate organization to do some standardizing, as such apparently un-studied and variable methods of packing are bound to lead to confusion and dissatisfaction to all concerned.

The bags, whether of burlap or paper, are taken to the company's own siding about 1.5 miles away by

two Mack trucks. Unfortunately the mine and mill are situated on the opposite side of the river from the Central Vermont Railroad so that a siding directly to the plant would mean an expensive bridge. It is consequently necessary to have the siding as close as possible to the nearest available highway bridge. This point is also much nearer than the freight station at the town of Waterbury. Shipments average about 72 tons of talc per day in bags and about 30,000 gross of crayons per year.

Power is brought to an outside



Motor Driven Emery Mill and Conveyor
to Air Separator

bank of transformers, at 11,000 volts and stepped down to 220 volts for distribution throughout the mill. All equipment is motor driven.

A desirable, and perhaps rather unusual feature, for this kind of operation is the fact that the company has provided seven four-room cottages for its employees, and has also purchased a nearby farm house. These are kept

in very good condition, in fact they are far superior to what one is accustomed to see in the vicinity of coal mines, for instance. As the village of Waterbury is about three miles distant from the mill with no very convenient means of transit these living quarters fill a distinct need.

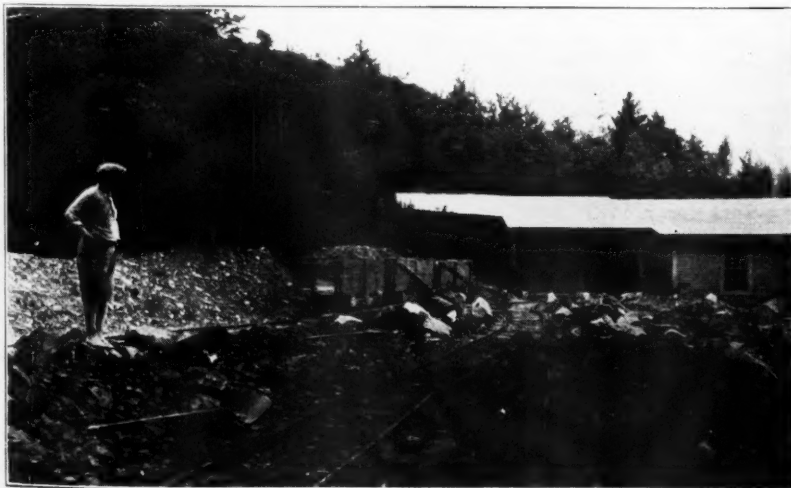
Westinghouse to Build in Detroit

The Westinghouse Electric and Manufacturing Company has purchased property in Detroit for the construction of a new building to house its district office, warehouses, and service stations. This is in accordance with the policy of the company to bring these units together in each district.

It is expected the new building will get under way in the first half of 1926. A floor space of 100,000 square feet will be necessary to take care of present requirements of the Detroit branch.

The practice of maintaining all the operating units of each branch in a central building now is in operation in several of the larger cities of the country, and has shown many advantages in rendering service and facilitating the handling of business. A smaller project also is under way at Miami, Florida.

Cities where single buildings now house the three units include—Philadelphia, Chicago, Kansas City, Cincinnati, Indianapolis, Huntington, Los Angeles, Minneapolis, Seattle and Atlanta.



Waste Disposal Tracks from Top of Mill

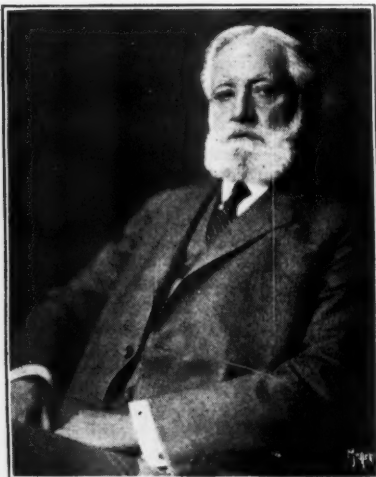
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Cement Pioneer Dies

William Dickinson, vice president of the Marquette Cement Manufacturing Company died at his winter home at Redlands, California, January 27. He had been ill for two months. His body was brought to Chicago for burial.

Mr. Dickinson was born in Hadley, Massachusetts, November 3, 1848 and came to Chicago when he was twelve years old. He was educated in the Chicago public schools, graduating from the old West Division High School.



William Dickinson

Mr. Dickinson started his business career in Chicago, in 1873, associated with Philip Wadsworth who operated the Empire Warehouse Company. This company purchased 250 barrels of cement from an importer and tried to introduce it in the middle west but met with a good deal of prejudice. At last they sold the new material to John V. Farwell, wholesale dry goods merchants for a structure they were about to erect. This was the first portland cement used in the middle west.

Later with his brother John and Jerome A. King, Mr. Dickinson formed the firm of Dickinson Bros. & King which was active for many years in the warehousing and selling of cement. This venture undoubtedly led to his entry into the cement manufacturing business.

The Marquette Cement Company, now known as the Marquette Cement Manufacturing Company, with which

Mr. Dickinson's name has been so long associated was organized in 1898. A year later the concern began operating with a capacity of 250 barrels a day. Mr. Dickinson was an active member of the Portland Cement Association and a regular attendant of its meetings. As one of the pioneers of the industry he was widely known all over the country. He is survived by a widow, and two children, Woodbridge Dickinson and Mrs. Max Hoffman.

New Hercules Engines

Simplicity and ruggedness are claimed by the manufacturers as the outstanding features of the new Hercules engines and power units. These features are the result of painstaking engineering and the elimination of everything not absolutely essential in the large 100. h.p. "TXA" and in the 20 h.p. type "O".

The combined, unified crank case and cylinder block provide a rigid support for the crankshaft preventing whipping and vibration. The water jacket extends the full length of the cylinder barrels. This promotes even expansion of the block and permits closer valve clearances.

The oil pan is of pressed steel and has but one horizontal and one vertical gasket. No oil lines are attached to the pan. All connecting rod and main bearings, the oil pump and the oil lines are readily accessible. The pan has no troughs, forced feed lubrication being used. All is strained through a cleaner before reaching the pump.

The design of the water pump support makes misalignment of the unit impossible. The gear with its shaft, bushing, sleeve, etc., can be removed through the rear without taking off the front cover or radiator. The oil pump is of the gear type with an easily adjusted regulating valve. It is driven through spiral gears at the rear end of the cam shaft.

The crank shaft is supported by three main bearings of more than adequate size and is put into both dynamic and static balance by the most improved method.

The main bearing caps as well as the connecting rods are drop forged of high carbon steel. These are accurately machined, tinned to insure bond between the steel and the white metal and babbited.

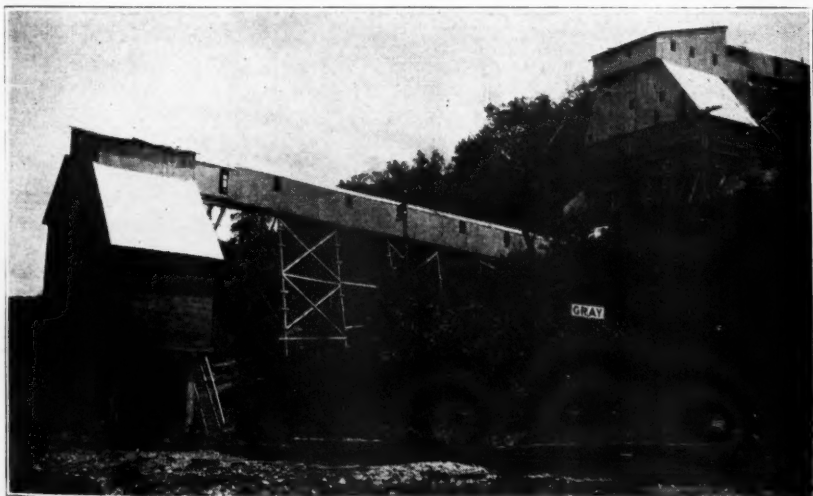
A Market Problem Profitably Solved By This Crushed Stone Company

By H. W. Munday

LOST CITY in Tulsa County, Oklahoma, has a flat topped hill about 1,000 acres in extent which is interesting to the crushed stone industry because two companies are carrying on successful and in many respects unusual crushed stone operations on this hill. This deposit is overlaid with a solid ledge of limestone about 50 feet thick which shows an average analysis of 88 per cent calcium carbonate. The lower strata consists of approximately 110 feet of shale, another layer of 30 feet of sandstone, above this is another layer of 34 feet of shale on top of which is about 50 feet of limestone. There is a very thin seam of coal between the limestone and the shale which must be separated from the clean stone. The supply of stone is practically inexhaustible and it passes all requirements for concrete highway work under Federal aid. It cements excellently and makes a strong and lasting road base. The Zenith Limestone Company and the Standard Paving Company are both operating plants here. The operations of the Standard Paving Company are the subject of this article as the operation of the Zenith Limestone Company were dis-

cussed in detail in the April 15th, 1925, number of Pit and Quarry.

However it will be interesting to state something here of the Zenith Limestone Company's operations as both plants are of the side-hill type. This company utilizes gravity throughout the plant with the exception of one belt conveyor which delivers the stone horizontally through an enclosed callery 200 feet to the screens. The plant is operated throughout by electricity with the exception of the steam shovel and locomotive. Armstrong well drills do the drilling and the stone is loaded by a Marion steam shovel into quarry cars which are hauled by a standard Baldwin steam locomotive to the plant. These cars are unloaded by a plow which is suspended on cables so that the bottom of the plow is on a level with the floor of the quarry car. As the car moves forward the plow scrapes the material off into the initial crusher. These cars were designed by Mr. Long, a partner in the company, and each have a capacity of 50 tons. The plant is equipped throughout with Kennedy gearless crushers and Kennedy screens. The tracks under the storage bins make



The Unloading Bins of the Plant Are Directly Over the Tracks



A View in the Quarry

it easy to load four cars at one time. The storage capacity is about 3,500 tons and there are 800 feet of storage track for empty cars and the same amount for loaded cars. The storage bins are made of 3-inch boards. Between each board there is a 3-inch air space. This type of bin retains the material and saves considerable in

lumber. The bottoms of the bins are constructed of 3-inch boards on end. Material is discharged from the bins through clamshell bin gates. The fine material is stored in bin sections directly below the screen house. The coarser sizes of stone are exposed to rain as there is no roofing over the storage bins. This is interesting but



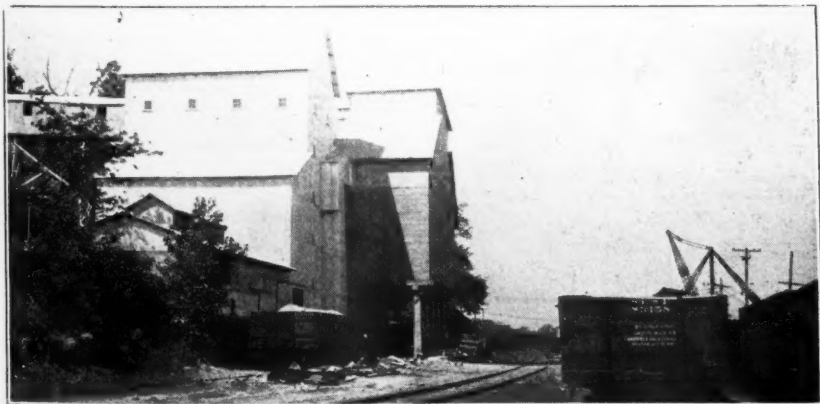
Belt Conveyor to the Loading Bins

practical as there is no need for keeping the coarser sizes of stone absolutely dry. At the discharge end of the belt conveyor there is a stone box or hopper from which material is fed to the screens. This hopper has sloping sides to which iron bars are fastened at right angles. These bars are so arranged as to permit a quantity of stone to lodge between them and thus form a protective surface for the sides of the hopper. This method reduces the wear to a considerable extent. Another interesting innovation has been adopted with the chute that delivers to the belt conveyor at the receiving end of the conveyor. This chute discharges in the same direction as the belt runs, and a number of holes have been punched toward the end of this chute. The fine material drops through these holes onto the belt and acts as a blanket for the heavier material which is discharged from the end of the chute. This arrangement undoubtedly reduces the surface wear on the belt. The chutes referred to are made of 10-inch pipe. As any particular section becomes worn, the pipe can be turned and a new surface exposed to the shock of falling stone. These closed chutes have proved to be very practical in the operation of this plant. At present the plant is producing 2,000 tons of stone per day in sizes of 2, 2½, 1, ½ and ¼ inches and dust. The plant is so arranged, however, that this production can easily be doubled if necessary. Stairways at the plant are all on the outside and were constructed to take advantage of the space between the boards that made up the side walls.

The boards for the stairs were cut a little longer than needed and were then fitted into the open spaces and nailed. The company is installing every known safety device for the protection of its employees.

The Standard Paving Company's plant has a capacity of 600 tons of crushed rock per eight-hour day, and the asphalt filler plant has a capacity of five tons per hour. The limestone ledge is overlaid with a layer of earth from six inches to six feet in depth. This stripping is done during the winter with Erie type B steam shovels and Ford trucks. The drilling operations are carried on with a Keystone electric drill rig, after which the rock is shot down in a single face wall. Du Pont 40 per cent powder is used in blasting. For auxiliary drilling Ingersoll Rand jack hammer drills are used. An Ingersoll Rand 600 cubic foot compressor furnishing unlimited air for this operation. By using a large compressor the quarry is never shut down due to any small inefficiencies of the compressor, such as leaky valves, etc. After being finally blasted to about one cubic foot, the rock is hand-picked so as to avoid any possibility of dirt in the final loading. After hand-picking, the stone is loaded into one-yard, V-shaped, Koppel side-dump cars and run by gravity to a chute which feeds the primary crusher. These cars are brought back to the men by a 3½ ton Burton gasoline locomotive. The face of the quarry is about 500 feet from the first crusher. Forty dump cars are operated.

The first crushing is made in the number 7½ Austin gyratory crusher.



The Storage Bin and Track Facilities

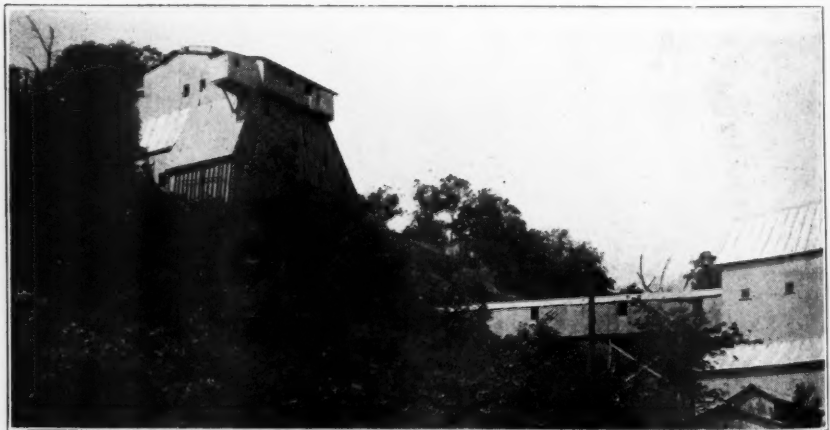


This Shows the Condition of the Stone

The stone is then elevated to an Austin screen above the storage bins. The rock which is of suitable size is there stored for transmission to the loading bins. The rock which has not been crushed small enough is sent to a number 5 Allis-Chalmers gyratory crusher which completes this operation. From this last crusher the rock is elevated to a second screen which sizes the rock. A main belt conveyor is provided for transmission of the rock separately, according to size, to a Hummer vibratory screen of the magnetic type where all dust and other foreign material is removed, leaving only clean, suitable rock, such as is required under the strictest Federal aid inspection. All elevators and belt conveyors are of Link Belt manufacture.

The first years of operation of this quarry soon showed that quite a bit of limestone dust and fine rocks would

be produced which were not suitable for concrete work. It soon became necessary to produce a material from this dust which would be suitable for market. The result was the installation of a Kennedy-Van Saum ball mill which produced an asphalt filler of suitable fineness. The material is also of great value as agricultural limestone on Oklahoma soils which are largely underlaid with sand stone. The dust is elevated to a BB hopper from which it is fed into a dryer of special design and of suitable capacity. This dryer removes all moisture, which has been collected by the limestone, by heating to a temperature of 350 degrees Fahrenheit. The heated dust is then elevated to a steel tank from which it is fed over an automatic table into a ball mill driven by a silent chain from a slip ring electric motor. After the limestone has been crushed to suitable fineness, it is



Note the Foliage Surrounding the Plant

picked up by a fan and elevated to a Kennedy cyclone dust collector where the coarse material is rejected to come back to the mill and the fine material drops into a storage bin. This process is repeated until all material will pass a fineness test of 93 per cent through 200 mesh and 98 per cent through 100 mesh. Under this storage bin is located a one-sack Bates bagging machine from which the product goes to immediate shipment or storage. This last operation is governed by the working of the quarry, as there is a certain amount of dust produced with each ton of stone crushed. An average production of five tons per hour can be easily maintained.

This plant is located close to the city of Tulsa which makes possible the use of commercial electric power; so all operations are carried on by electricity. A small machine and blacksmith shop is maintained at the quarry for quick repairs. However, the main shops of this company are located at Tulsa, only six miles away, so that any repairs may be accomplished in minimum time.

The loading facilities are exceptionally good. The loading bins for rock are located directly over a switch from the St. Louis and San Francisco Railroad and are high enough so that gondola cars can be loaded from them by gravity. The asphalt filler plant is located on the same switch and box cars are run right to the door for loading. This arrangement insures quick service due to the plant being located only three miles from the West Tulsa yards of one of the largest railroads in Oklahoma.

The rock is either used on the company's own projects in city and highway work or as the capacity of the plant is large enough there is available about 300 tons a day of crushed rock and 20 tons of asphalt filler.

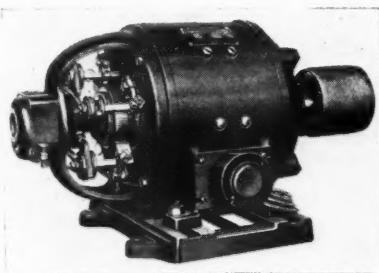
This quarry is organized as a separate department and is a complete unit in itself under the supervision of the president of the company Mr. I. V. Gray. Mr. J. A. Bartlett is superintendent and sales manager. Mr. Jeff Huddleston has charge of operations at the quarry.

Mr. Robert J. Beler has recently joined the Pittsburgh sales office of Foote Bros. Gear and Machine Company, as assistant to Mr. W. G. Kerr, district representative.

Louis Allis D. C. Motors

The Louis Allis Company has developed a new direct current motor, known as their type N. A. This is a 40 per cent rating general purpose motor with heavy overload capacity. The new series is interchangeable, rating for rating, in all essential dimensions with the Louis Allis polyphase motors.

Improved design and ventilation insures uniform cooling throughout the windings and makes an unusually cool motor under operation. The bearing chamber is designed to hold an extra quantity of oil, making frequent renewals of oil supply unnecessary. The bearing inspection opening is closed by a removable cover. This metal cover, while permitting easy inspection, gives in effect a dust tight bearing chamber.



The New Direct Current Motor

Entire elimination of oil trouble is claimed by virtue of a new design incorporated in the bearing. Trouble experienced in the past, due to oil soaked windings, from oil throwing, creepage, and so forth, is now made impossible by the present design.

Southwest Road Show

The First Annual Southwest Road Show and School will be held at Wichita, Kansas, March 2, 3, 4, and 5 under the auspices of the Thresher and Tractor club of that city. Word has been received by F. G. Wieland, the general manager that the entire southwest will participate in the exhibition. The federal government has promised to send the largest and most complete exhibit it has displayed anywhere and the American Road Builders will have its exhibit at the school. The school is primarily for the 50,000 state, county and township officials in the territory and the 20,000 contractors and dealers.

Slate in 1925

The value of the slate sold at the quarries in 1925 was \$12,785,000, according to the estimates furnished by producers to the Bureau of Mines, Department of Commerce. This was 9 per cent more than the value reported for 1924. Slate reported sold for roofing, blackboards, and granules and flour showed increase in both quantity and value, while the other products decreased.

The roofing slate sold amounted to 477,000 squares, valued at \$4,900,000, an increase of 2 per cent in quantity and 6 per cent in value. There was an increase of 41 cents in the average per square.

The total sales of mill stock amounted to 10,405,000 square feet, valued at \$4,110,000, an increase of 4 per cent in quantity and 5 per cent in value. Sales of mill stock for blackboards was the only variety of mill product that showed increased sales—23 per cent in quantity and 39 per cent in value. The estimated output was 5,000,000 square feet, valued at \$1,596,000.

Sales of structural slate—2,276,000 square feet, valued at \$880,000—decreased 3 per cent in quantity. Sales of electrical slate, estimated at 1,654,000 square feet, valued at \$1,355,000, decreased 8 per cent in quantity.

In 1925 as in 1924 strikes in some

of the quarries in the Pennsylvania district had the effect of curtailing the output of roofing slate and all classes of mill stock. There were also strikes in the quarries of the New York-Vermont district. The general demand for roofing slate was as good or better than in 1924 during the first part of the year, and prices were reported higher in 1925. The demand for structural and electrical slate increased toward the latter part of the year. The demand for blackboard material was exceptionally good until about October when it slowed down considerably.

The sales of crushed slate for roofing granules and flour in 1925 was estimated at 540,000 short tons, valued at \$3,685,000, an increase of 5 per cent in quantity. The average value per ton was somewhat higher than in 1924.

The accompanying table compares the estimated sales of slate by quarries in 1925, by uses, with the sales in 1924.

The Mundy Sales Corporation, distributors for the J. S. Mundy Hoisting Engine Co., has appointed the Carbine-Harang Machinery and Supply Company of New Orleans as its representative in southern Louisiana.

Roofing Slate, Mill Stock,^a and Slate Granules Sold in the United States in 1924 and 1925, by Uses

Use	1924		1925 (estimated)		
	Quantity	Value ^b	Quantity	Value ^b	
Roofing	squares	469,393	\$4,626,614	477,000	\$4,900,000
Approximate short tons.....	158,420	.....	161,000	.....
Electrical	sq. feet	1,801,450	1,518,092	1,654,000	1,355,000
Approximate short tons.....	12,900	.....	12,000	.....
Structural and sanitary.....	sq. feet	2,346,050	951,964	2,276,000	880,000
Approximate short tons.....	16,640	.....	16,000	.....
Grave vaults and covers.....	sq. feet	566,160	142,167	552,000	142,000
Approximate short tons.....	8,100	.....	8,000	.....
Blackboards and bulletin boards.....	sq. feet	4,069,670	1,151,767	5,000,000	1,596,000
Approximate short tons.....	10,930	.....	14,000	.....
Billiard-table tops.....	sq. feet	341,200	131,028	286,000	117,000
Approximate short tons.....	2,400	.....	2,000	.....
School slates	pieces	1,710,240	27,348	1,220,000	20,000
Approximate square feet.....	884,650	.....	637,000	.....
Approximate short tons.....	1,200	.....	850	.....
Granules	short tons	512,810	3,178,454	540,000	3,685,000
Other	short tons (estimated)	4,300	48,582	8,150	90,000
Total (quantities approximate, in short tons)	727,700	\$11,776,016	762,000	\$12,785,000	

^aIn 1924 the mill stock sold, including school slates, was 10,009,180 square feet, valued at \$3,922,366; in 1925, 10,405,000 square feet, valued at \$4,110,000.

^bF. O. B. at point of shipment.

Loading Sand and Gravel By Derrick

THREE years ago Antonio Beatrice purchased thirteen acres of ground at Newton Lower Falls, Massachusetts. A 1,000 foot frontage on a paved highway was a feature of this property. The location was only seven miles from Boston. A good grade of sand and gravel with but little overburden existed on the property. A company known as A. Beatrice and Son was organized and a modest capital provided for the erection of a sand and gravel plant. The first purchase included an Erie type B steam shovel with a 1½ yard bucket and a Conant portable loader. Good business resulted from the start, and today an economical operation is carried on with an average daily production of more than 250 yards and a plant capable of producing 500 yards.

The deposit is being worked in the shape of a horse shoe. The floor of the pit is about 10 feet below the level of the abutting highway. All material is delivered by truck, and the plant has been built and the deposit is being worked so that trucks can get in and out with ease.

The bank averages 75 feet in height.

A Clyde steel derrick equipped with a clamshell bucket loads the material direct to a 5 yard field hopper. This derrick is equipped with a Clyde steam hoist and a separate Clyde swinging engine to operate it. The illustrations accompanying this article give an excellent picture of the operation of this unit.

The material is fed from the field hopper by a New England feeder to a New England scalping screen 6 feet long and 40 inches in diameter with 2¼ inch perforations. The over-size material passes to a 14x28 inch New England crusher. All material passing the scalping screen is handled by a New England bucket elevator with a capacity of 2 tons per minute to a New England screen 20 feet long and 48 inches in diameter. The tailings from this screen pass to a small New England crusher. The material is discharged directly to four bins of 600 tons capacity. Sand, ½, 1 and 2 inch gravel are produced and stored separately. These bins were designed and built by the New England Road Machinery Company.

Trucks are loaded from directly



Notice the Approach to the Plant



The Derrick Loading Sand and Gravel

under the storage bins. Six trucks handle the delivery of all material. Four of these trucks are Packards and two are Macks. The Mack trucks are equipped with Heil dump bodies. The market radius is less than 20 miles and can be served quickly and economically. Material can also be stored outside when necessary and the trucks loaded by the Conant loader. An interesting point is that material is sold by the yardage method. This

is not an accurate method, and truck scales will be installed soon. If a belt conveyor were installed with a movable field hopper, the layout would be more flexible and an installation of such a belt conveyor is being planned.

The plant is operated by a force of 14 men. Six of these are truck drivers; four others serve as common laborers around the pit and plant. There is one man on the shovel, one fireman, one man to operate the derrick and one to watch the screening and crushing plant. Antonio Beatrice is president of the company and his son, Carl Beatrice, manages plant operations.

New Incorporations

Portland Cement Products Corporation, Dover, Delaware. Capital \$3,500,000. To deal in products of the earth. Harry C. Hand, Michael A. Castaldi, Raymond J. Gorman, New York City, incorporators.

Grays Harbor Cement Products Company, Aberdeen, Washington. Increasing capital stock from \$20,000 to \$26,000.

The Cincinnati Concrete Co., Wilmington, Delaware. Manufacturing of building materials from cinders, cement, clay, etc. Capital \$2,100,000.

The Kent Sand & Gravel Co., Cleveland, Ohio. Capital \$500. Edward T. Butler, Jr., M. M. Feidner, J. G. Fogg, A. O. Dickey, H. E. Habelman, incorporators.



The Plant of A. Beatrice & Son

Hydraulic Dredge Efficiency Features This New Sand and Gravel Plant

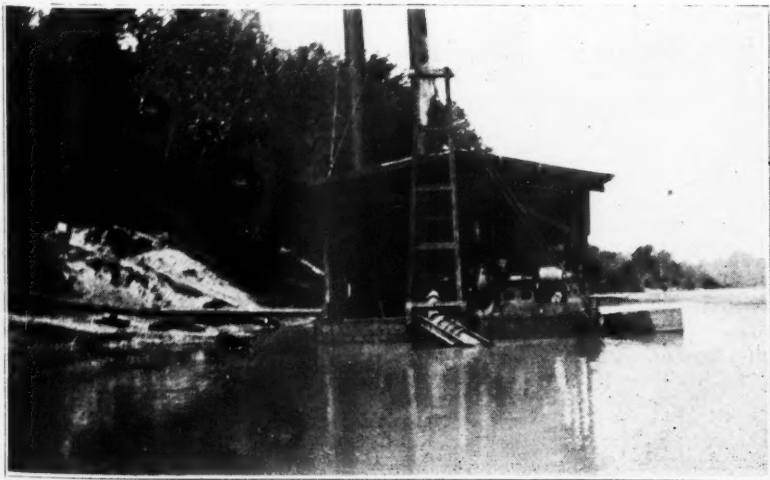
SEPTEMBER FIRST of last year saw the christening of the new hydraulic dredge plant of the Pearl River Gravel Company. This plant is located upon a deposit of river gravel lying along the Pearl River, on the New Orleans Great Northern railroad thirty-four miles south of Jackson, Mississippi. The character of the material as shown by samples and tests from prospect holes made previous to construction, showed hard durable sand and gravel of an unusually well graded size, from fine to coarse particles. On the basis of separation as between gravel and sand, by one-quarter inch mesh, the test samples showed an average ratio of two parts gravel to one part sand. This ratio has run almost uniformly, one car of sand for each two cars of gravel, in operations to date.

The plant consists of a floating hydraulic dredge, and a stationary gravity screen and tippie situated on two parallel loading tracks so that both materials are loaded simultaneously. The hydraulic dredge consists of a wooden barge fifty feet in length with a twenty-five foot beam, and has a depth of fifty-four inches and draws twenty-seven inches of water in working condition. The hydraulic unit is a ten inch Amsco manganese steel heavy duty pump, with ten inch suction and

discharge. This unit runs at 600 r.p.m. maximum.

The pump is driven by belt connection from a sixteen by sixteen center crank automatic McEwen oil engine running at 215 r.p.m. Various experts advised that an automatically governed engine was not suitable for this character of service, for the reason that it was believed that this type would stall under loads occasioned by heavy surges of solids. However, the Pearl River Gravel Company find that the governor of this engine is of such design that it is possible to so adjust the tension on the governor spring that the engine actually picks up speed under momentary over-loads and then falls into her regular stride. Nor is there any difficulty from the stalling of the engine. In fact, its performance is entirely satisfactory.

Steam is furnished by two horizontal internally fired Casey-Hedges dredge boat boilers rated at 70 h.p. each. Feed water is taken from a Cochrane open feed water heater of the thoroughfare type utilizing the exhaust from the engine through a short connection. Feed water temperatures are maintained by this means, at 210 degrees. The heater is located at sufficient height above the hot water pumps to avoid re-evaporation in the suction connections. Ken-



The New Dredge Unit of the Pearl River Gravel Company



A Load Ready

tucky nut coal is used for fuel.

The ten inch suction line, which is forty-five feet in length measured from the center of hose connection, to pump is raised, lowered and slewed by means of a 6 $\frac{1}{4}$ by 8 Clyde double cylinder, three drum dredging engine consisting of one rear drum for hoisting and two forward pony drums for slewing.

This covers all the mechanical equipment on the dredge boat with the exception, of course, of two boilers-feed-pumps, one for cold water and one for hot water, which are so connected that either, or both may feed either hot or cold water to the boilers, or may be used jointly as fire pumps or for removing water from the hull. Penberthy ejecters are used both for priming the gravel pump and for removing normal leakage from the hull.

The hull is built entirely of southern long leaf pine timbers with three parallel bulkheads fore and aft, and is divided transversely with 6 by 12 beam timbers on four foot centres for supporting the deck and bottom. All timbers below the water line were painted with Baltimore copper marine paint, and all seams calked with cotton and oakum.

The screen and loading tipple consists of a simple timber frame work with a $\frac{1}{2}$ by 1 woven wire screen, nine feet in width by twelve feet long. This is carried on angle-iron supports on 2 $\frac{1}{2}$ foot centers and set upon an angle of thirty-one degrees to the horizontal. Sand and water which passes this screen may go either directly to a settling tank, situated over the center of the sand track, or it may be rescreened to remove the pea-gravel by passing through a number 4 screen cloth. This number 4 screen is secured to a frame which may be readily removed and any other size mesh substituted. An eight inch automatic counter-balanced valve loads the sand directly into car beneath the settling hopper. Oversize, either one inch or two inches, may be taken away by a removable screen hinged at the bottom of the main screen. Arrangements are being made so that material rejected by any of the screens may be passed into a flume and returned to the pump-sump, from which it may be reclaimed at any time.

The pump discharge is delivered to the top of the tipple approximately thirty feet above top of rail, or about forty-five feet above water level. Good-year rubber sleeves are used in the suction and discharge lines throughout. The main drive, from engine to pump consists of an eighteen inch, seven ply Goodyear rubber belt with



The Track to the Loading Bin



Filling a Car with Material

number 55 Alligator lacing. The drive pulley is seventy-two inches in diameter by twenty inches face, and the driven pulley twenty-six inches in diameter by twenty-four inch face, and are on approximately twenty feet centers. It has been found necessary to use a saw mill type hinged idler pulley on the top of the belt near the driven pulley to obtain a greater arc of contact.

With the layout described, it is possible to load four forty-ton cars of material per hour. The plant was placed in operation on September 1st, 1925, and the best day's performance consisted in loading nineteen cars in six hours, including delays in spotting and moving cars by hand. The loading tracks were built on a grade of about one per cent through the tippie with the expectation that it would be possible to load and spot cars by gravity. However, it was found necessary to install a car puller consisting of a two cylinder single drum reversible Emerson-Brantingham steam hoist connected to a twenty-five horsepower portable boiler. It is not necessary to use this apparatus except when the

output exceeds twelve to fifteen cars per day.

The operations of the Pearl River Gravel Company are under the management of R. N. Kinnaird. The other officers include C. B. Johnson, vice-president; J. C. Liggett, secretary, and B. H. Cawthon, assistant manager.

New Westinghouse Booklet

A comprehensive booklet entitled "The Engineering Achievements of the Westinghouse Electric and Manufacturing Company," has just been published by that concern. It is the work of H. W. Cole, assistant director of engineering of the company and is a credit to his professional and literary ability.

Unlike many booklets of this kind Mr. Cope's work is thoroughly indexed and is so arranged that it is easy to find any subject treated. It is profusely illustrated and the pictures are so well chosen that they are themselves an index to the text.

A generous chapter is devoted to the generation and distribution of power. It announces that work is well under way on the largest generating unit ever built and describes other important installations. Steam turbines, condensers, stokers, transportation and industries are also treated in chapters.



A Train Load

Ohio Single Line Gasoline Shovel

The Ohio Single Line gasoline shovel has just been placed on the market after rigid tests and the new product of the Ohio Power Shovel Company is said to be meeting with an enthusiastic reception. The manufacturers claim for their new machine, faster operation, lower upkeep costs, higher lift and greater range of action. It has a 1 yard dipper capacity and is convertible by changing the boom to a crane for a 1 yard clam shell or a drag line excavator with a bucket of the same capacity.

The new features claimed for the shovel include, single line hoist. Timken roller bearings instead of bronze or babbit, positive crowding mechanism, one piece cast iron boom, greater accessibility, one piece revolving base casting minimum number of parts, one piece truck casting and a large and powerful engine.

Through the use of the single line hoist which is made possible by multiplying the power in the mechanism instead of by the cable and numerous sheaves, higher lift, increased digging angle, slow traveling cable and compact arrangement are brought about.

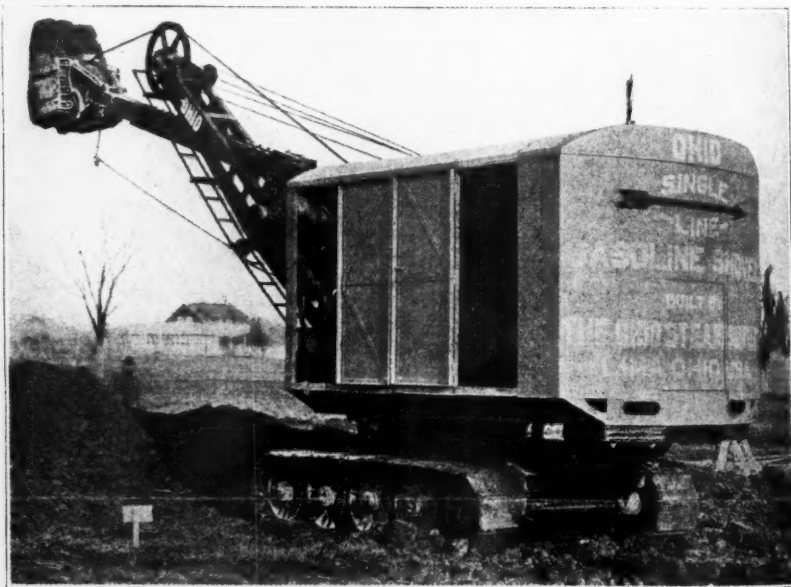
It is claimed the single line permits hoisting the dipper 16% per cent

higher and the digging angle is increased by the same percentage. The cable running only a third as fast as that of a three part hoist and over only one large sheave and drum gets only a minimum of wear.

The shovel is equipped with either a gasoline engine or an electric motor as desired. The engine is exceptionally sturdy and powerful having a torque of 400 foot pounds and developing 80 h.p. An electric starting and lighting system is supplied when wanted. The engine is directly connected to the reduction gears through a powerful double disc clutch which can be entirely removed without disturbing either the engine or the gear case. An electric motor can be connected in the same manner. The reduction gears are wholly enclosed and run in oil.

The caterpillar truck employs large wheels for continuous treads. This simplifies construction and places the wheels high out of the mud.

Star Sand & Gravel Corporation, Rochester, N. Y. Capital \$25,000. To excavate, buy and sell sands, concrete and concrete products. John M. Redman, Maude Redman, Chester M. Wallace, directors.



Ohio Single Line Gasoline Shovel.

Quarrying in a Historic Valley

By George Ransom

HISTORIC and picturesque Lake Champlain Valley contains a large amount of limestone especially near its northern end. In many places this has a curious formation which makes it easy to quarry, with the result that the traveller in that part of the country frequently comes across operations of various sizes which in their aggregate are extremely important. Formerly these operations were mostly of the lime burning variety but in late years, since the advent of concrete construction, state road building and the active improvement of highways in general, many rock crushing plants have sprung up in this region. Often the peculiar formation of the deposit adds a great deal to the interest of these operations, even to the casual passerby.

On the outskirts of Plattsburg, N. Y., on a high hill overlooking Lake Champlain, is a deposit of limestone worked by the firm of Gebo and Bushey for the purpose of producing crushed rock. It is interesting for two reasons—the peculiar rock formation and the fact that it is rather an isolated plant operated by steam.

The peculiarities of the formation are shown in the accompanying illustrations. It will be seen that the stratification is in immense sheets with a westward inclination. The floor of the quarry, which covers a large area but never has been worked

very deep, is of a smoothness suggestive of concrete and forms an excellent base for the crusher and rock bins. Furthermore the soil covering the rock is so thin that it is practically negligible.

It is plain enough that to get stone cut of such a formation is very easy. The machinery which has been installed is of the simplest kind. There is a Climax jaw crusher, a Good Roads Machinery Company bucket elevator and screen with appropriate bins, and a steam engine, made by the Steam Engine Company of Watertown, N. Y., for motive power. A Farguhar portable boiler supplies the steam for engines and drills. The crusher is located below a dumping platform between the engine house and screen.

Undoubtedly an operation of this kind carried on in a small way can nevertheless be profitable. The installation need not be expensive, the rock is not difficult to quarry and there are markets at hand. In winter when it is difficult to work and the market is practically non-existent the overhead is but a small factor to carry.

Adolphus Florentine has entered this same field with a small operation in Plattsburg. This plant was discussed in the January 15th number.

The fact that Plattsburg is an important vacation center serving the

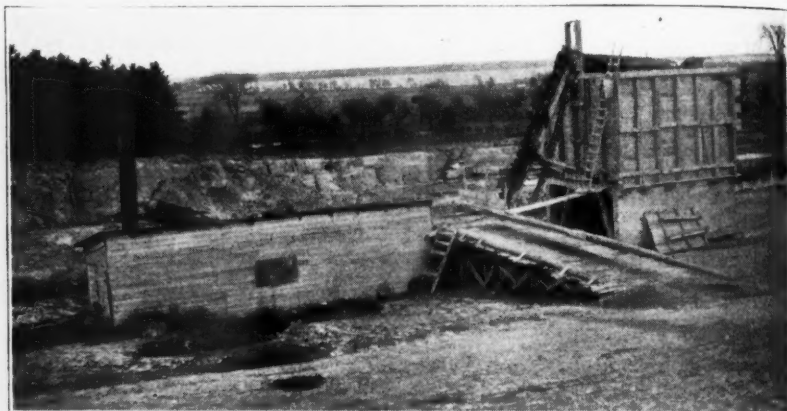


View of Quarry Showing Stratification and Drill Holes

northern end of Lake Champlain and the Adirondacks accounts for the excellent roads and the need for keeping these roads improved. Plattsburg is also on the direct automobile route between Montreal and New York. Good roads in this community are important and the demand for crushed stone will increase considerably during the coming year. Building con-

struction in this territory is also normal.

Gebo and Bushey are in a position to expand as rapidly as the demand increases or as is desired. The present operations are returning a unit profit which would only be possible up to a certain production when considerable changes in plant would be necessary.



Crushing Plant with Engine House, Screen on Opposite Side of Dumping Platform



Face of Quarry Showing Stratification and Thin Top Soil



View of Smooth Quarry Floor

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River Sand and Crushed Flint Compared As Fine Aggregate for Concrete

By E. C. L. Wagner

Consulting Engineer, Kansas City, Missouri*

DURING the past year, we have made tests on sands to determine the relative merits of natural river sand as compared to rolled Flint sand. Care was taken to obtain representative samples of sand as actually delivered on the ground ready for use on Federal Aid road jobs. The tests were made at the Road Materials Testing Laboratory of the Engineering Experiment Station at the Kansas State Agricultural College at Manhattan, Kansas. All the tests were made by the same operator under standard laboratory conditions. Two different river sands were tested, taken from plants on two different rivers in Kansas; one sample of Flint sand was used. The two river sands are denoted in this report as sands R1, and R2, and the Flint sand is denoted in this report as F. The cement used in making the strength tests was a mixture of two standard brands, bought on the open market, and complying with the standard specifications for portland cement.

The physical qualities of the sands were as follows:

	R1	R2	F
Specific gravity . . .	2.65	2.63	2.65
Per cent of voids . .	37	35	46
Fineness modulus	2.94	2.89	2.95
Wt. dry, lbs. per cu. ft.	104.5	107.8	89.2
Wt. with 5% moisture	81.9	81.0	64.6
Wt. with 10% moisture	88.6	87.8	66.7
Bulking with 5% moisture	34%	39%	45%
Bulking with 10% moisture	30%	35%	47%
Tensile and compressive strength tests were made by breaking 30 specimens of each sand for tension and 30 specimens for compression. The specimens were made of 1:3 mortar. The averages of the results are as follows:			
	R1	R2	F
Tensile strength, lb. per sq. in. . . .	368	409	596
Compressive strength, lbs. per sq. in. . . .	4747	4823	4221

Tests were then made to determine the permeability and loss of weight due to freezing. Twelve cylinders, 2 inches by 4 inches, were made of one to three mortar from each sand. Six cylinders of each sand were used for the permeability test and six for the freezing test. The permeability for absorption was determined by drying the cylinders to a constant weight at 220 degrees Fahrenheit, immersing in water for 24 hours and weighing again. This was done five times for each cylinder. After having absorbed water thus, they were crushed to determine their compressive strength.

The resistance to alternate freezing and thawing was determined by immersing the specimens in water for 24 hours at room temperature, freezing for 16 hours, and thawing by immersing in water at 77 degrees Fahrenheit for 8 hours. After thawing, each specimen was brushed carefully to remove any material which might have been loosened by the frost action, and weighed. The original saturated weight of each cylinder was used as a basis for calculation of loss. After being subjected to this alternate freezing and thawing 15 times, the cylinders were crushed to determine their compressive strength. The results of these tests are as follows:

	R1	R2	F
Water absorbed in 24 hours, per cent by weight.	6.77%	6.56%	9.5%
Compressive strength absorption, lbs. per sq. in.	3750	3358	1758
Loss in weight after freezing 15 times	3.73%	0.14%	1.04%
Compressive strength after freezing, lbs. per sq. in.	3983	3950	2474
Original compressive strength, lbs.	4747	4823	4221
Per cent lost after absorption	21	30	58
Per cent lost after freezing	16	18	41
A study of the physical qualities			

*A report presented at the annual meeting of the Missouri Valley Association of Sand and Gravel Producers on December 17, 1925.

of the sands shows that they are made of similar mineral matter because their specific gravity is about the same and they have about the same fineness modulus, although the flint sand is not graded as uniformly as the river sand. Fifty-one per cent of the flint sand passed a number 10 sieve and was retained on a number 20 sieve and 36 per cent of it passed a number 8 sieve and was retained on a number 14 sieve. The flint sand was, therefore, deficient in fine material, whereas the two river sands had a very uniform rating. This lack of fine material in the flint sand combined with the fact that the sand grains were either long and narrow, or flat, thin grains caused a very high per cent of voids in the flint sand, 46 per cent compared to 36 per cent for the average river sand. This high per cent of voids is again reflected in the dry weight per cubic foot, 89.2 pounds for flint sand compared to 106 for the average of the river sand. It is true, therefore, that the flint sand is considerably lighter than the river sand but since their specific gravity is the same, practically, a solid cubic foot of flint would weigh the same as a solid voidless cubic foot of river sand. The difference in the weight of the two sands may, therefore, be expressed by saying that there is less sand in a cubic foot of flint sand than in a cubic foot of river sand. This is due entirely to the difference in voids and to the poor grading of the flint sand and to the peculiar shape of the grains.

Another very noticeable difference in the two sands is the bulking effect of moisture. In the case of river sand R1 the maximum bulking was with 5 per cent of moisture and equalled 34 per cent and with the river sand R2 the maximum was 39 per cent, also with 5 per cent of moisture. With this same per cent of moisture, flint sand bulks 45 per cent. When 10 per cent of moisture had been reached, the bulking of the two river sands had decreased, whereas with flint sand the bulking had increased to 47 per cent.

Tests show that the average weight of river sand is 2860 pounds per cubic yard, whereas the average weight of flint sand is 2410 pounds per cubic yard.

Specifications for proportioning concrete call for certain quantities of sand based on the sand being measured when it is dry. However, ordinary

conditions are that the sand contains an appreciable amount of moisture when it is handled on the job. Due to the bulking effect of moisture with a moisture content of between 5 and 10 per cent, it is necessary to handle about $1\frac{1}{2}$ yards of wet flint sand in order to have one yard when dry, whereas under the worst conditions, it is only necessary to handle about $1\frac{1}{4}$ yards of river sand to have one yard of dry sand. It is, therefore, necessary to handle a mass of sand about 16 per cent greater in bulk for flint sand than for river sand on a given piece of work. It is also of more importance to make corrections for bulking due to moisture when using flint sand than if using river sand.

It is a matter of common knowledge that concrete made of flint sand is hard to work. This fact was borne out in the laboratory tests which showed a less workability and less flowability of material for flint sand than for river sand. This difficulty with flint sand is an inherent difficulty, due to the shape of the grains of sand. Flint, when crushed, naturally breaks into long, thin particles and thin, flat particles which are not easily compacted and which tend to remain in the position in which they first assume, rather than to flow around each other and form a dense mass. Also on actual construction, the flint sand floats to the top.

Strength tests show that flint sand is stronger in tension, whereas the river sand is considerably stronger in compression when made into specimens of 1:3 mortar. It seems probable that the additional tensile strength of flint sand is due to the shape of the grains, whereas the reduced compressive strength may be reasonably considered as due to the excess of voids in the flint sand which are in turn caused by the shape of the grains.

The interesting thing and the feature of practical importance regarding strength, however, is the strength of the two materials as shown after the concrete has been subjected to the forces of nature. The tearing down effect of the forces of nature was tested by allowing cylinders made of the two sands to absorb water and by subjecting them to alternate freezing and thawing, as reported above. In both of these tests the flint sand showed itself to be very much inferior to river sand. Cylinders made of flint

sand absorb about 50 per cent more water than cylinders made of river sand and after having been allowed to absorb water for 24 hours, for five times, the flint cylinder showed a loss of strength of 58 per cent, whereas the river sand showed a loss of strength of only 25 per cent. Freezing and thawing resulted in a loss of weight of the cylinders of about 1 per cent for flint sand and about 3¼ per cent for one river sand and 1/7 of 1 per cent for the other river sand. After having been frozen and thawed 15 times, the flint sand showed a loss of strength of 41 per cent compared to 18 per cent and 16 per cent for the two river sands.

In this climate, the greatest forces tending to deteriorate concrete is the weather, the combination of deterioration by water and tearing down by frost. In countries which have a small rainfall and no frost (such as Egypt, Italy and Southern France) engineering structures have endured for two or three thousand years. In those countries, the climate was such that the effect of rain and frost was reduced to a minimum, but in our climate, where we have alternate wet and dry periods and alternate periods of excessive heat and excessive cold, the most important feature determining durability of concrete is its ability to withstand these tearing down forces. All of us have noticed concrete streets, for instance, which had almost no traffic and which have gone to pieces as rapidly as other similar streets which carried heavy traffic. We cannot overestimate the importance of the durability in the concrete which we turn out. It is not of a great deal of value to prove that one certain material is stronger or weaker than another material unless we know that after long continued use this relative virtue will be the same. Our structures are too costly for us to afford to build them for a short period of time and we cannot say that one material is as good as another because its early strength compares favorably, when we know that it will not continue after a short period of exposure to the weather to retain its strength superiority.

We are, therefore, forced to the conclusion, and justified in stating it, that favorable strength tests and low unit weight are not important and should not be given serious consideration. The logical conclusion to arrive at is that concrete made of flint sand is in-

ferior from every point of view to concrete made of river sand because the flint sand concrete will not endure and is, therefore, not worth the money which it costs, even if that first cost may be slightly less than the first cost of river sand concrete.

Clutch Built Into Motor

A new type synchronous motor has been developed to meet the need for a motor having extra high starting torque, a low starting current, and the high efficiency and unity power-factor characteristics of a synchronous motor. The new motor, available in standard ratings from 60 to 600 h.p. with larger ratings as special machines, is being manufactured by the Westinghouse Electric and Manufacturing Company. The apparatus consists of a standard synchronous motor combined with a magnetic clutch in a single compact unit. The over-all dimensions are practically the same as the hitherto standard synchronous motors of the same ratings, with the exception of the length, which is from four to ten inches longer.

It is particularly adapted for driving crushing or grinding machinery and other loads requiring high starting torque. The starting torque of the clutch-type motor is the same as the maximum running torque, since the motor is brought to synchronous speed and fully excited before applying the load. It can thus exert any required torque up to the value of its pullout torque during starting periods, without shock and at an acceleration rate controllable by adjusting the clutch excitation current through rheostat control. The clutch cannot be excited during starting periods, and the rotor quickly reaches full speed.

The rotor section of the clutch is faced with asbestos lining, riveted to a steel ring and made in halves for easy removal. The armature member of the clutch has a smooth surface where it comes in contact with the brake lining, and steel shims may be inserted between the asbestos lining and the ring to compensate for wear.

The armature member is mounted on a steel disc which has sufficient flexibility to allow the clutch faces to make contact when the clutch coil is excited. When excitation is removed, the flexible member will spring back into its normal position which provides sufficient clearance between the friction surfaces to prevent contact.

Caterpillars for Bucyrus Heavy Dragline

Steam shovel design has undergone marked improvement during the last few years. To appreciate this, one has only to compare the design of a few years ago with the present day machines.

It is only fourteen years ago that the Bucyrus Company shipped the first dragline to be mounted on caterpillars. It was a machine driven by an oil-engine and weighing approximately 96 tons. At that time it was seriously questioned whether this type of mounting would ever prove practical for excavating machinery. Today most all the smaller shovels are equipped with this mounting.

There has now been built and placed in operation in the field, caterpillar mounting for the Class 320 dragline. This mounting, also available for the 320-B shovel, is composed of four units, one under each corner of the base. These units are made up of two caterpillar belts 36 inches wide, each of which forms a continuous track for two large diameter rollers, an idler tumbler and a driving tumbler.

The caterpillars are almost shoulder high to an average man. Some idea of the size of this new caterpillar-mounted machine is given by the fact that, ready for operation, it weighs approximately a million pounds or 500 tons. In spite of this tremendous weight, the bearing area of the caterpillar belts is such that it can propel itself across soft, yielding ground without difficulty.

The mounting, of course, is of interest to the owner and user of such a large machine, in that it eliminates a large number of the pitmen and track men which are required when such a machine is mounted on railroad trucks. Another great advantage to the man in the field is that this mounting does away with track breakage which is bound to occur if care is not used by the pit men. This new machine also makes the turning of corners a simple matter compared with the troublesome job of turning a truck mounted machine.

Bay City Builds Warehouse

The Bay City Dredge Works has under construction, a steel warehouse and service station, for the convenience of Eastern contractors at Roselle, New Jersey. This warehouse will be used for the storage of new Bay City Excavators, Model 16-B and Model 4, and a complete line of parts will be carried in stock for immediate delivery. The warehouse will be under the direction of the Eastern office of the Company at 302 Broadway, New York City, Eugene P. Reading, manager.

The Bay City Dredge Works announces the appointment of two new sales representatives, Herbert Gad, Martin Building, Birmingham, Alabama, for Mississippi and Alabama, and Messrs. Rumsey and Rumsey, 485 51st Street, Milwaukee, Wisconsin, for Wisconsin.



Bucyrus 320 Electric Dragline Stripping Phosphate

An Economical Plant Investment Returning Good Dividends

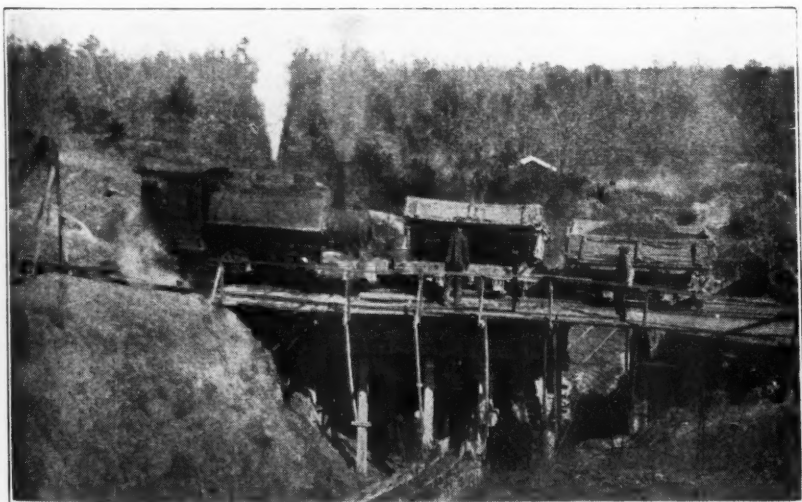
SITUATED in Franklin county, northern Alabama, on the highest railroad point in the state and about 25 miles south of Sheffield and Muscle Shoals, on the Tennessee River at a point known as Spruce Pine, is the plant of the Spruce Pine Sand and Gravel Company. This territory is well known for its wonderful climate, picturesque lakes and trees. The operations of this company are of interest not only because of the details involved but also because a woman, Miss Rose Collins, is actively associated with the operations as secretary-treasurer. There are so few women concerned with the problems of plant operation in the sand and gravel industry that Miss Collins was very welcome as the only woman delegate at the recent annual convention of the National Sand and Gravel Association at Atlanta.

The plant is on the crest of a ridge that slopes steeply into a valley where a pond has been formed for water supply purposes. The pit operations are conducted on the slope of the hill. The property covers 400 acres and contains an excellent grade of sand and gravel sufficient to last about 300 years at the present rate of demand. In addition to this deposit of sand and gravel there is a deposit of

exceptionally good clay underlying the gravel which will be used in the manufacture of face brick. Another unusual condition is that a good sized deposit of iron ore exists on the property. This ore has been mined at intervals to the extent of more than 50,000 tons.

The formation of this deposit is unusual. It appears to have been forced up by the earth during some violent movement in the distant past. The only overburden is the thin strip of top soil supporting the grass and shrubbery. The water supply is unlimited. The plant is alongside the tracks of the Northern Alabama railroad affording easy access to such points as Birmingham, Chattanooga, Louisville and Memphis.

Two Bucyrus shovels are loading the material in the pit into Western 5 yard dump cars which are hauled by an 18 ton Vulcan steam locomotive to the grizzly. One of these shovels is an 18-B machine with a 26 foot boom and a $\frac{3}{4}$ -yard bucket and is at present working against a 40 foot bank. The face of this bank is drilled with hand augers and shot down with Dumorite. The other shovel is a 30-B machine with a 20 foot boom and a 1 yard bucket. This shovel is working against a hard gravel bank.

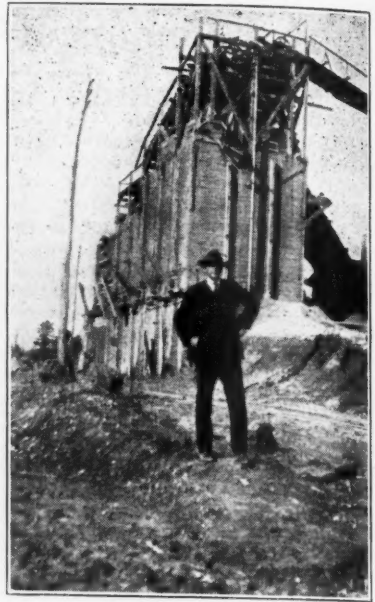


The Initial Discharge Point



The Conveyor to the Plant

The discharge to the grizzly passes through to a hopper which feeds a belt conveyor delivering to the washing and screening plant. This belt conveyor is 375 foot centers and consists of a 24 inch wide United States rubber belt. The belt conveyor elevates the material 65 feet and dis-



John Collins

charges to a hopper which feeds a set of three Link Belt conical screens.

The first screen has $1\frac{1}{2}$ inch round perforations and separates material from $\frac{1}{4}$ to $1\frac{1}{4}$ inch which is sold as concrete gravel. The oversize is delivered to bin storage and sold with the railroad ballast. The second screen has $\frac{1}{2}$ -inch round perforations and the oversize from this screen

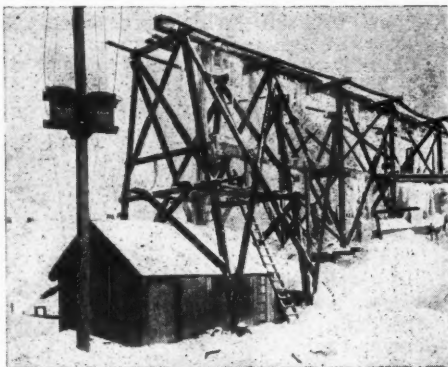
(Continued to page 106)



A View of the Pit

Weather makes no difference with Morris Centrifugal Pumps

IN this shed is a little Morris Pump which elevates water 30 feet from an open ditch into lines for the hydraulic removal of tailings at one of the mines of the Anaconda Copper Co., at Butte, Montana. Fourteen more Morris Pumps at the same plant are working at times in zero weather and some of them have had 12-year service.



The Morris Pump in this particular installation is small, but its bigger brothers are equally reliable, and it indicates the preference for Morris Pumps by able engineers of large industrial corporations when they have trying conditions to meet.

Whether you need a pump for dredging, hydraulic conveying, boosting or any other sand and gravel producing and handling work, there are one or more standard Morris designs that will meet every requirement, or if not we will build to order.

You can depend upon any Morris Pump for steady efficient service, full capacity, and freedom from excessive repair interruptions and expense. Write for Bulletin 122.

Morris Machine Works **Baldwinsville, N. Y.**

Originators of Centrifugal Pumps, both single and Multi-stage, and builders for practically all purposes since 1864

Branch Offices: New York, 39-41 Cortlandt St.; Philadelphia, Forest Bldg.; Cleveland, Engineers' Bldg.; Chicago, 217 N. Jefferson St.; Boston, 79 Milk St.; Pittsburgh, 320 Second Ave.; Detroit, Penobscot Bldg.; Charlotte, Realty Bldg.; Houston, 119 Main St.

Sales Representatives: Buffalo, St. Paul, Kansas City, Denver, Salt Lake City, Portland, Ore., Los Angeles, New Orleans.

MORRIS

CENTRIFUGAL PUMPS

(Continued from page 104)
 passes to the concrete gravel bin. The third screen has $\frac{1}{8}$ -inch slotted mesh. The oversize from this screen is sold principally as roofing gravel. The material passing the third conical screen passes to a flat screen with $\frac{1}{8}$ -inch perforations. The rejects from this screen pass into a 72 inch Link Belt sand separator, while the material passing through the screen passes to another 72 inch Link Belt sand separator. In all, six grades of material are produced as follows: railroad ballast, concrete gravel, roofing gravel, concrete sand, building sand, and asphalt sand. All material is thoroughly washed. In each of the conical screens there is one pipe running through the center of the screen and another outside to keep the perforations clean.

The wash from the conical screens and from the sand separators is delivered by a trough to a settling tank designed by W. H. Collins, who was formerly secretary, treasurer and general manager. An asphalt filler sand of excellent quality and fineness is recovered in this way. This tank is designed to interrupt the flow of the wash sufficiently to allow the sand to settle.

The gravel is sprayed with water again as it is being loaded to the cars. Water is obtained from the artificial pond formed in the valley. One 50 h.p. Bessemer oil engine supplies the power for pumping and another of the same size operates the plant.

The plant capacity is 1,000 tons per day, but the production is dependent upon the availability of cars. The present officers of the company are J. R. Collins, president; A. Philbrick, vice-president; and Miss Rose Collins, secretary-treasurer. A. G. DeArman is plant superintendent. The plant represents an economical investment returning excellent dividends. The company is marketing an especially high grade, carefully washed and well sized product.

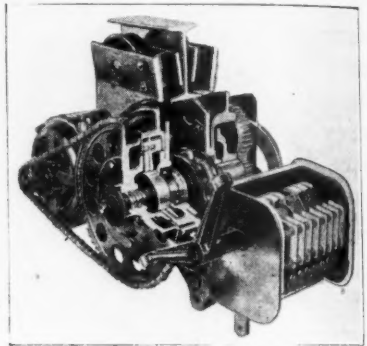
Slagstone Products Corp., Dover, Delaware. Capital \$100,000. Deal in building material of all kinds.

The Cement Transit Company, Newaygo, Mich., Capital 5,000 shares, no par value. Siegel W. Judd, N. B. Kelly, and A. W. Ansonge, officers.

B. M. Arthur Lumber Co., Inc. Deal in lumber, coal, lime and builders' materials. R. Hansell, J. Vernon Pimm, E. M. MacFarland, incorporators, Philadelphia, Pa.

Yale Electric Chain Hoist

The Yale and Towne Manufacturing Company has recently developed a new ball-bearing electric chain hoist known as Model 20B. This hoist embodies such features as close headroom, long lift, higher speed, automatic top and bottom limit stops, and greater over-all strength. This hoist has very unusual factors of safety in the strength of the load-supporting members and is designed to withstand shock loads so common to this class of equipment. All suspension members are made of the highest quality steel.



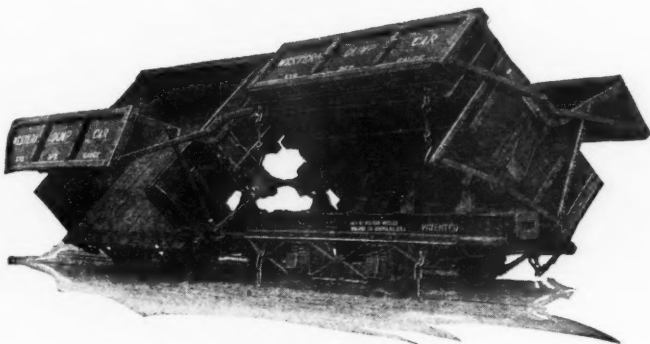
Electric Chain Hoists

The Yale 20B can be quickly adapted to any overhead system. The side plates of the trolley carriage can be spaced on steel bars to fit the desired beam flange. Yale electrically welded steel chain can be furnished for varying lengths of lift. The centralized steel suspension means a constantly balanced load on the trolley wheels and hoisting unit irrespective of load position.

The mechanism is fully enclosed in oil-tight chambers and is compact and easily accessible for inspection without expert service. The ball-bearing load sheave, the latest Yale development, adds a big factor for low current consumption and general all-around hoisting efficiency.

Large chrome vanadium steel ball bearings surrounding the substantial steel load sheave reduce friction and make the hoist still more efficient, requiring a minimum amount of power and giving increased life. The heavy steel one-piece load sheave, ground on an arbor to give perfect concentricity for the ball races, is bronze-bushed for the driving pinion, and splash lubrication provides a continuous flow of oil over gears, pinions and bearings.

"Substituted Westerns,— Increased Capacity 50%"



Western 6-yard dump car, standard gauge

The General Superintendent said:

"After we substituted those Westerns we increased our capacity 50% due to the cars alone."

This was in stripping. Western dump cars are equally efficient in handling rock from the quarry. They will keep shovel and crusher busy.

Made in all practical sizes from 1½ cubic yards to 30 cubic yards capacity and made to stand up in severe quarry service.

Let us know your haulage conditions. Our engineers are haulage experts and may be able to suggest an installation and track layout that will increase your output.

Write today

Western

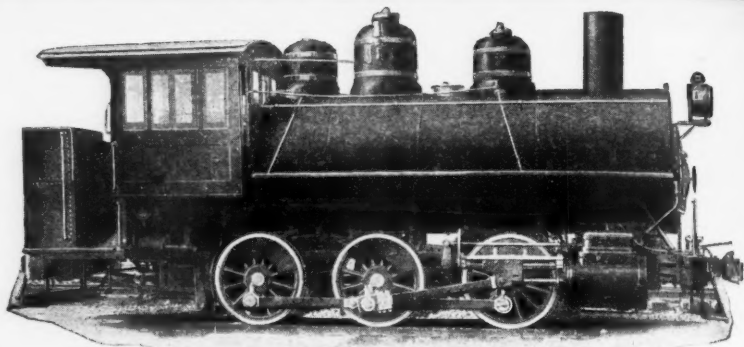


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- 1—Model 105 NORTHWEST COMBINATION SHOVEL, CRANE OR DRAGLINE, $\frac{3}{4}$ Yd. Shovel Dipper, One Yd. Clam Shell Bucket, Boom 40-45 ft. Located Chicago.
- 2—NORTHWEST MODEL 104 DRAGLINES Booms 40 or 45 ft. One Yard Bucket.

Announcement of List

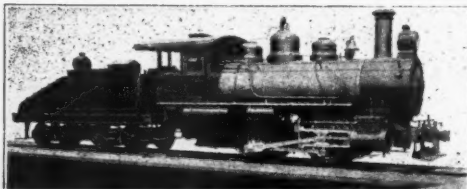
Before purchasing or leasing equipment for your spring operations look over our new list. If you have not received it, we would be glad to mail you one at once. It has a special feature whereby you may allow rentals to apply upon purchase.

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Just thoroughly overhauled, in strictly first class condition. Standard gauge Baldwin four wheel 50 ton Switching Engine, 18"x24" cylinders.



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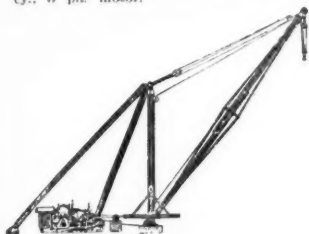
Gas or Electric Hoists and Derricks

Available for immediate shipment f.o.b. New York, Chicago, Philadelphia, Pittsburgh

GASOLINE OR ELECTRIC HOISTS

Large quantity American double drum hoists with attached swinging gear, capacity 6000 lbs. on single line at 162 ft. per minute with—new 55 H.P. Climax gasoline engine—37 H.P. 220 or 440 volt, 60 cy. 3 ph., A.C. electric motor—35 H.P. 220 volt, D.C. electric motor—or without power for belt drive.

- 2—52 H.P. single drum Lidgerwood, with 220 volt, 60 cy., 3 ph., A.C. motor, complete with one winch head.
- 1—75 H.P. double drum Clyde hoist, capacity 10,000 lbs. on rear drum, 5,000 lbs. on front drum, with 220 volt, 60 cy., 3 ph. motor.



DERRICKS

Large quantity late model American Stiff Leg Derricks, mast 14x14x40 ft. booms 14x14x 60 ft., stiff legs, 14x14x50 or 60 ft. sills if desired, with 12 ft. steel bull wheel, for hook work or bucket operation.

Large quantity late model American Stiff Leg Derricks, mast 16x16x40 ft., booms 14x14x80 ft., trussed with hog rods, legs and sills 14x14 with 16-ft. steel bull wheel, arranged for hook or bucket operation.

Also several Guy Derricks, wood or steel, arranged for single line work or for operating clam shell bucket.

CABLEWAYS

- 11—3 and 5-ton, Street Bros. (Howson) Cableways, complete with automatic dump buckets.

COMPRESSORS

- 1—2-stage, 950 ft. Sullivan, Class N.B. Compressor.
- 1—2-stage, 1500 ft. Sullivan, stationary Compressor.
- 2—Chicago Pneumatic Portable gasoline driven, on rubber-tired wheels, cap. 210 cu. ft.

CRANES

- 1—15-ton O & S, 8-wheel M. C. B., 40-ft. boom, bucket operating.
- 1—O & S 7-ton Crane, 30-ft. boom, ¾-yd. clamshell bucket, traction wheels.
- 1—Byers Auto Crane, 30-ft. boom, ¾-yd. bucket, traction wheels, steam.

LOCOMOTIVES

- 1—Davenport std. ga. 20-ton, 10x16 cylinders, saddle tank, No. 1497.
- 1—Porter std. ga. saddle tank, 14x22 cylinders, weight 42 tons, like new, only one year of service, shop No. 6853.
- 3—7-ton, 24-in. ga., Plymouth, gasoline.
- 6—3-ton, 24-in. ga., gasoline. 3—Plymouth. 3—Whitcomb Fordson.

STEAM SHOVELS

- 1—78-C Bucyrus, 1923 model, 30 ft. boom, 19 ft. dipper stick, 3-yd. dipper, on caterpillar. Shop No. 4001.
- 2—Type "B" Erie Shovels, mounted on caterpillars; one with Crane Boom.
- 2—Thews on traction wheels, 1, Type A1, 1, Type 0.

STEAM HOISTS

- 12—Three-Drum Hoists, with or without boilers. Sizes 10x12, 9x12, 9x10, 8¼x10 and 7x10, with separate swingers for derrick work. All makes.
- 54—Two-Drum Hoists, with or without boilers. Sizes 12x12, 10x12, 9x10, 8¼x10, 7x10, 6¼x10, 6x8, and 5x8. Can be equipped with holding drum for bucket work.

CABLEWAY EXCAVATORS

- 1—Sauerman 1-yd. Cableway Excavator with 8¼x10 double drum 2-speed hoist, with all necessary cable and sheaves for 1,000 ft. span.
- 2—Link-Belt Dull Cableway Excavator Buckets; one 1½-yd.; one 1-yd.

DRILLS

- 2—No. 3½ Keystone drills.
- 6—Model 21, Waugh "Denver" derrick drills.
- 8—Model 31, Waugh "Denver" column drills.
- 1—D.W. 64, Sullivan column drill.
- 1—Sullivan tripod drill.

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Cranes—Draglines—Shovels

- 2—Type "B" Erie Shovels with Crane attach.
- 1—Type "A" Erie shovel with Crane attach.
- 1—O&S, 12-ton Crane, Gas Power.
- 1—Marion 21 Crane with Dragline attach.
- 1—P&H No. 210, 48-ft. Boom, Gas Power.
- 1—Monighan, 1½-T Dragline, Diesel Engine.
- 1—P&H No. 206, Gas Shovel.
- 1—Monighan 3-T Walker 80-ft. Boom, 2½-yd. Bucket, equipped Diesel Engine.
- 1—Monighan 2-T Walker Type, 70-hp. Charter Engine, 70-ft. Boom, 2-yd. Bucket.
- 1—Monighan 1-T Walker Type, 40-ft. Boom, 10-ft. extension 1-yd. Page Bucket.
- 1—Bucyrus Class 24 with 115-ft. Boom and 3½-yd. Bucket, Steam Power.
- 1—Model 31 Marion Caterpillar, 1-yd. Dipper.
- 1—14-B Bucyrus Caterpillar ¾-yd. Dipper.
- 1—Marion 37 on Caterpillar.
- 20—Various makes and sizes, R. R. and Trac. Wheel Type, from 1-yd. to 6-yd. cap.

HOISTING ENGINES

- 1—9x10 Lidgerwood D/C D/D.
- 2—Lidgerwood 7x10 D/C D/D, with Boilers.
- 1—Lambert D/C D/D with Boilers.
- 2—Lidgerwood 8½x10 D/C D/D, with Boilers.
- 1—10x12 D/D Lidgerwood.
- 1—Stroudsburg 8½x10 D/C 3-D with Butt Strapped Boiler.

KEYSTONE EXCAVATORS

- 2—Model 4 Keystone, equipped with Skimmer and Ditching Scoops, Steam Power.

LOCOMOTIVES

- 1—36-in. Ga. Burton, 8-Ton, Gas.
- 1—36-in. Ga. Porter, 18-Ton, Saddle Tank.
- 1—36-in. Ga. Davenport, 14-Ton, Saddle Tank.
- 1—24-in. Ga. Plymouth, 3Ton, Gas.

AIR COMPRESSORS

- 1—Sullivan WK-31 port., 4-cyl. motor, 175 ft.

BOILERS

- 1—Kewaunee Loco. Type, Butt Strapped, 80 hp., 125 lbs. pres. with Feed Pump.

BUCKETS

- 1—1-yd. Hayward Class "E" Clam Shell.
- 20—30 to 35-cu. ft. Controllable Bottom Pumps.
- 1—¾-yd. Class "E" Hayward.
- 1—¾-yd. Williams Favorite.
- 1—¾-yd. Standard.

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LOCOMOTIVE CRANES

- 1—No. 8 Browning 50' boom, used three months.
- 1—No. 8 Browning 50' or 75' boom, rebuilt.
- 2—23 ton McMyler 50' boom.
- 1—30 ton McMyler 50' or 75' boom.
- 1—10 ton Industrial—4 wheel.

STEAM SHOVELS

¾ yard—Erie, Osgood or Bucyrus on caterpillar.

LOCOMOTIVES & CARS

- 4—24" gauge Whitcomb, gasoline.
- 14,000' of 24" gauge track.
- 60—24" gauge cars with hatch boxes.

BUCKETS

- 10—¾-yard New Blaw-Knox.

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Air Compressors, Concrete Mixers, Road Rollers, Water Wagons, Pumps, Tanks and Graders.

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Good Used Equipment Hudson Terminal Bldg. Clean Business Methods

STEAM SHOVELS

- 1—¾-yd. type B Erie high lift, traction wheel.
- 1—¾-yd. type B Erie No. 1566 on Caterpillar.
- 1—¾-yd. type B Erie No. 1769 on Caterpillar.
- 1—¾-yd. Al Thew on Traction Wheels.
- 1—No. 4 Keystone Excavator No. 4296, with skimmer scoop and trench bucket.

HOISTS (Steam)

- 1—7x10 single drum, Skeleton Lidgerwood.
- 1—8½x10 three drum and boiler Lambert.
- 1—10x12 D. D. and Swinger Skeleton Lidgerwood.

HOISTS (Electric)

- 1—22 H.P. two drum Flory with 2Ph. 60C. 220V. Motor and Solenoid brake.
- 30—Separate Clyde Electric Swingers with 10 H.P. 3Ph. 60C. 220V. Motors, or without Motors.

DERRICKS

- 1—10 ton 80' boom 14"x14" Terry Timber 212 Leg with 12" Bullwheel.
- 1—20 ton 70' boom Steel Guy (Erector's type)

For Sale

MARION 36 SHOVEL

Full Revolving—Traction Wheels, 24' Boom, 16' Dipper Stick, 1¼ or 1½ yd. Dipper. Guaranteed first-class condition.

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Two 16"x10", One 12"x24", Three 30"x10", Two 36"x16", Two 42"x16", and One 24"x54" Crushing Rolls. Swing hammer mills and other types.

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Two No. 3 Gates, One No. 4 Gates, Two No. 5 Gates, Two No. 6 Gates & McCully, Two No. 7½ Gates and Austin, Three No. 8 Gates & Traylor, One No. 9 Gates Gyratory Crushers.

JAW CRUSHERS

Three 9"x15", One 10"x20", Two 12"x24", One 15"x30", One 18"x36", One 24"x36", One 36"x42", and One 22"x50" Jaw Crushers.

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Three No. 1, Two No. 1½ and One No. 2 Sturtevant Rotary Fine Crushers.

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Two 3'x20', Three 4'x30', One 4½'x30', One 5'x40', Three 5½'x40', Two 6'x60', and One 7'x60' Direct Heat Rotary Dryers. One 5'x25', One 6'x30', Two 8'x8' Ruggles Coles type "A" and one 4'x20' Ruggles Coles type "B" Double Shell Rotary Dryers.

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One 4'x40', One 5'x50', Two 6'x60', One 6'x125', One 7'x60', One 7½'x80' Rotary Kilns.

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1 Steel Stiff Leg Derrick, Wood Mast.
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Telsmith preferred. Must be in good condition.

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5 Yd. Heavy Duty Steam Shovel Dipper.
We want to move this equipment and are making prices that will do it.
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**50 Ton Capacity
HOPPER BOTTOM STEEL
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1 1/4-yd. to 2-yd. dipper, caterpillar type, standard equipment. Must be in good operating condition.

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84x72, 36x60, 54x24, 18x30

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22x52", 36x48", 42x48", 20x24", 15x36"
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- 92 ft. Ingersoll-Rand, ER-1, Belted.
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- 1190 ft. Ingersoll-Rand, Imperial XB-2, Belted.
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- 1400 ft. Chicago Pneumatic, OCB, Belt.
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Model 60 Marion Steam Shovel, R.R. trucks, $2\frac{1}{2}$ yd. dipper, located Delaware, Ohio. Rebuilt at cost of \$3,500.00, and not used since. Bargain price.

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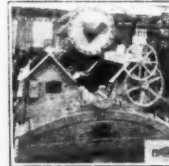
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Several oil engines, steam engines, motors, generators, pumps, etc.

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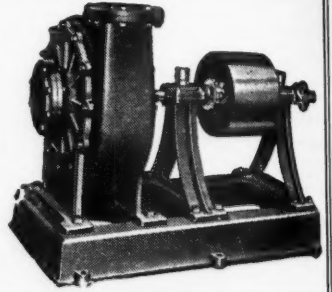
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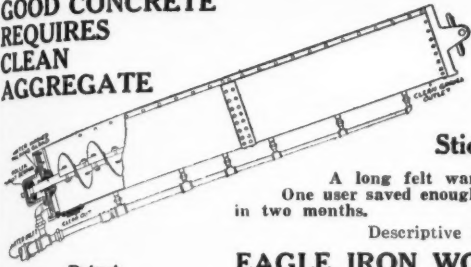
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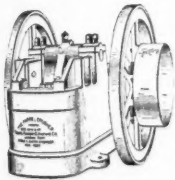
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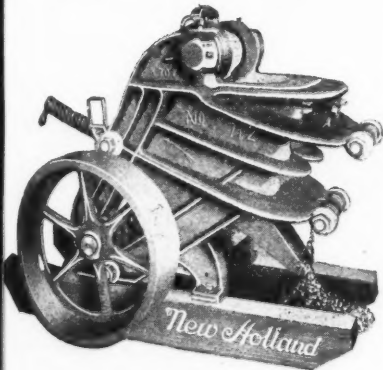


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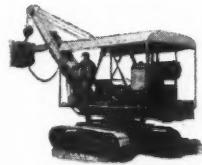
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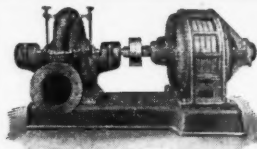
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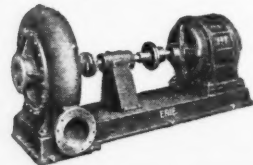
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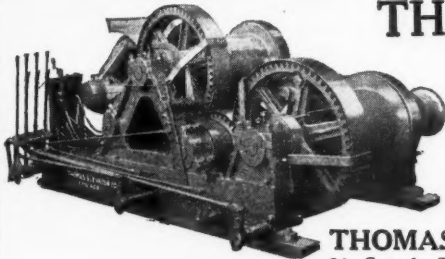
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Issue and P.&Q.
Hand Book

**BAY CITY
DREDGE
WORKS**

Bay City, Mich.

THOMAS HOISTS



Thomas Hoists are responsible for the records established by the big producers of sand, gravel and stone and are made in single and two-speed types, either steam or electric. Let us discuss your hoist problems with you.

THOMAS ELEVATOR COMPANY
21 South Hoyne Avenue CHICAGO

Uniform Product—Low Cost



Uniformity of product plus low cost of operation are two factors to be considered when meeting competition.

Gruendler Pulverizers are built to perform. Ask us to show you.

Stationary or Portable Capacity 1 to 50 tons per hour.

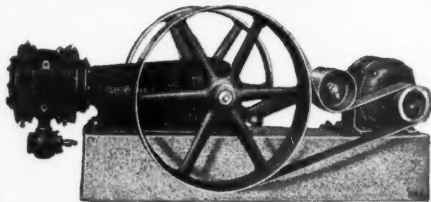
Write for Booklet, "Folks & Field Need Lime."

Gruendler PATENT CRUSHER & PULVERIZER CO.
First & Franklin, St. Louis, Mo.

PENNS VANIA

AIR COMPRESSORS

There is a certain distinctive appearance about high class machinery which stamps it as the product of fine craftsmanship. Instinctively one knows there has been built into such equipment those characteristics of design and construction which give positive assurance of enduring service.



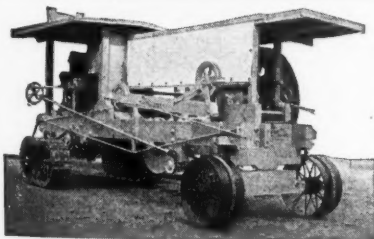
Ask for Bulletin 123-P

PENNSYLVANIA PUMP & COMPRESSOR CO.

Main Office and Works:
EASTON, PA.

The "CLIPPER"

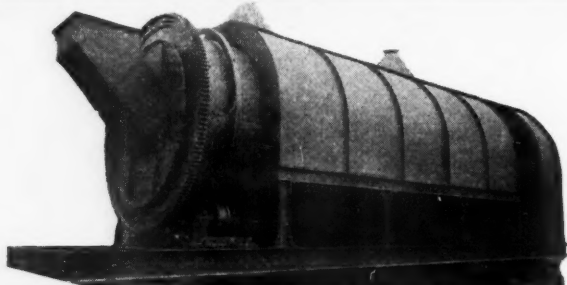
late improved Blast Hole Drill. The "CLIPPER" predominates, has stood the test, and is approved by critics. Furnished also in the round wheel.



(Established 1842)

THE LOOMIS MACHINE CO.

15 Market St., Tiffin, Ohio



It Pays to Clean Cement Bags

Because it saves thousands in profits that you lose otherwise. Every old empty has about a pound of good cement that can be reclaimed.

The Continuous Cement Bag Cleaner can clean as many as 10,000 bags per hour, extracting about one pound of cement per bag. Think of the saving—the profit! Many big plants are using them.

Other Nazareth products are Bins, Revolving Screens, Screw Conveyors, Gears, Quarry Cars.

Let us send you detailed information

NAZARETH FOUNDRY AND MACHINE COMPANY

Works: Nazareth, Pa.

New York: 106 Front St.



FOR any kind of operation in sand, gravel, rock or other pit material where uninterrupted day-in-and-day-out production is a vital factor you can always depend upon

Marion
Power Shovels
Electric-Steam-Gasoline-Electric

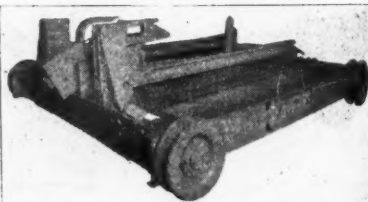
For full particulars regarding all types and sizes, write to shovel headquarters



MARION STEAM SHOVEL CO.
Marion, Ohio

G.L.I.

SEAVERNS' Patented Automatic Quarry Car Dumper



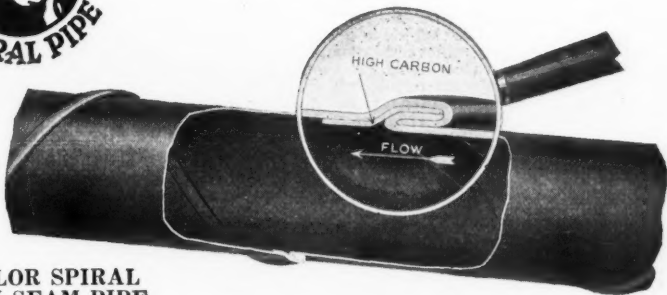
Used by the largest operators everywhere. The Quarry Car so interlocks with the car dumper that they are inseparable and constitute a safe and reliable unit during operation. The cars are of structural steel with large shafts, roller bearings and double flanged cast steel wheels. No additional power is necessary to operate. No time is lost in dislodging rock lost between the rails or in repairing broken rails and stringers.

Better let us send you full information, and start the new year without trouble at the dump.

James B. Seaverns Company
ENGINEERS, MANUFACTURERS
1315 South Oakley Avenue
CHICAGO



A Better Pipe



NAYLOR SPIRAL LOCK-SEAM PIPE

For Sand and Gravel conveyance, or other abrasive materials, the high carbon wearing strip is inserted which greatly prolongs its life.

For Water Supply Lines our

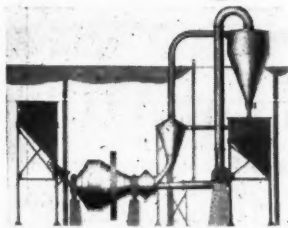
pressure pipe, asphalted inside and out, with the added strength of the four ply lock-seam, is ideal.

Made of No. 18 and No. 10 gauge, from 3" to 30" in diameter. Write for a sample and prices.

NAYLOR SPIRAL PIPE COMPANY

1234 East 92nd Street, Chicago
Our pipe users are our pipe boosters

Hardinge Conical Mills



Grinding Classifying Conveying
In one operation

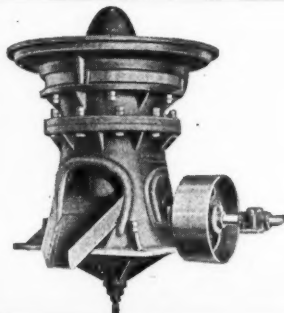
Write for information regarding the Hardinge Grinding Unit.

Bulletin No. 17 gives full details.

Hardinge Company, Incorporated,
York, Pa.

120 Broadway
New York

Newhouse Bldg.
Salt Lake City



AUSTIN Gyratory Crushers

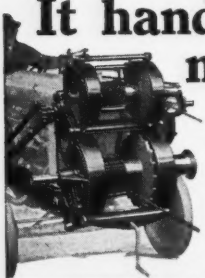
Portable and Stationary Plants

Capacities, 5 to 300 tons per hour

Catalog 29Q tells the whole story. Write for your copy today.

AUSTIN MANUFACTURING CO.
NEW YORK CHICAGO SAN FRANCISCO

It handles stone, sand and gravel more economically



This new hoist cuts the cost of material handling immensely in sand and gravel pit and quarry work. It operates drag line scrapers and furnishes quick, cheap power for all kinds of hoisting and pulling operations. Being automotive, it goes anywhere under its own power. Completely controlled from Fordson driver's seat. Write for free Hoisting Manual.

**Willamette Iron & Steel Works,
Portland, Oregon, U. S. A.**

Allison
AUTOMOTIVE
HOIST

For the Fordson

BUILT BY WILLAMETTE

Crushing and Grinding

Material Handling

Old Equipment Modernized

Properties Examined

C. H. SONNTAG

Engineer

Cape Girardeau, Mo.

Portland Cement Plants

Electric Power Transmission

Power Plants

Waste Heat Boilers

For Separating Dry Ground Materials

80 Mesh to 350 Mesh

GAYCO CENTRIFUGAL SEPARATORS

Six Sizes—30 Inch to 14 Feet Diameter

RUBERT M. GAY COMPANY, Inc. 114 Liberty St., N. Y.

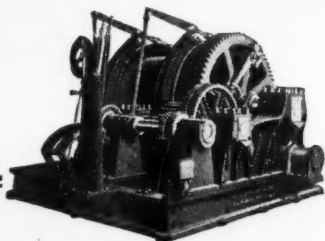
STRANGE, ISN'T IT,

that the possession of a luxury immediately makes it a necessity? Just so the users of a product invariably expect greater results from its use. The makers of Tisco Manganese Steel are constantly endeavoring to meet this greater expectancy by producing a better product and providing a Service that you will appreciate.

Wearing parts for all types of machinery subject to severe service

Taylor-Wharton Iron & Steel Co.,

Highbridge, N. J.



F LORY Hoists are dependable, rugged, and very efficient in operation. There is a Flory Hoist for every purpose. Use one on your next job.

Write for our latest catalog—we'll gladly send it to you. Flory engineers will assist you with any hoist problems.

Agents in Principal Cities

S. FLORY MFG. CO.
Bangor, Penna.

Hayward Buckets

"Dig for all the World"

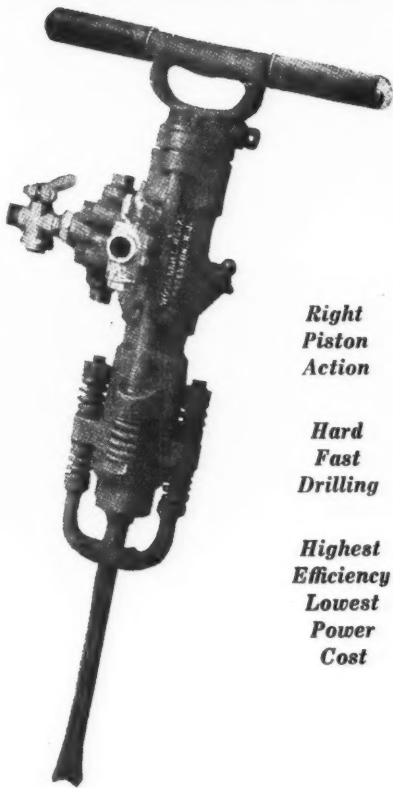
Orient or Occident, Hayward Buckets are in evidence on engineering projects of every kind because they consistently dig loads like that shown here.

Tell us the class of work you do and we'll gladly send Bulletins showing Hayward Buckets on jobs similar to yours.

THE HAYWARD COMPANY
54-56 Church St., New York, N. Y.



RAPID ECONOMICAL DRILLING With **WOOD HAMMER DRILLS**



*Right
Piston
Action*

*Hard
Fast
Drilling*

*Highest
Efficiency
Lowest
Power
Cost*

WOOD DRILL WORKS

30-36 Dale Avenue
Paterson, N. J.

Chicago Office: 5108 W. Lake St.

All-Steel BINS



All-Steel—Permanent

SELF-CLEANING—NO DEAD STORAGE

Many Sizes: **A Blaw-Knox Steel Bin will serve year after year without expense or interruption for repairs or rebuilding.**

85 Tons
135 Tons
210 Tons
300 Tons

Equipped with the "no-jam" strike off gate. Quick shipment can be made—if you need one in a hurry.

BLAW-KNOX COMPANY

635 Farmers Bank Bldg., Pittsburgh, Pa.

NEW YORK—
30 E. 42nd St.

CHICAGO—
Peoples Gas Bldg.

DETROIT—
Lincoln Bldg.

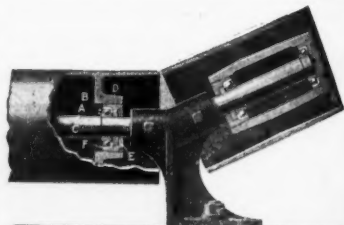
BALTIMORE—
Bayard & Warner Sts.

BIRMINGHAM—
Brown-Marx Bldg.

BUFFALO—
Genesee Bldg.


BLAW-KNOX

CONWEIGH



Ball-Bearing Idlers

CONWEIGH Ball Bearing Troughing and Return Idlers have solved many a troublesome conveyor problem by the natural reduction of friction which they produce.

Conweigh Ball Bearing Idlers are easy to lubricate, of durable hardened steel construction and give maximum conveyor volume.

Submit your problem to us.

**THE CONVEYING
WEIGHER COMPANY**

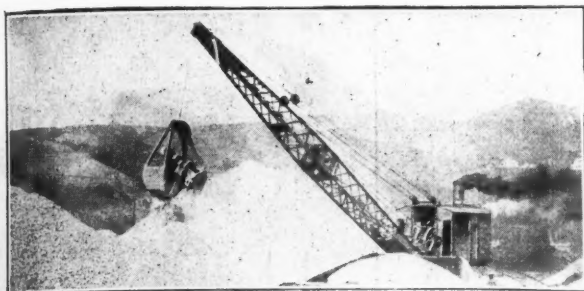
ENGINEERS & CONTRACTORS

90 West Street,

New York

OHIO LOCOMOTIVE CRANES

The best solution of your material handling problem is the Ohio Locomotive Crane. Its speed, low operating and low maintenance cost have made it the leader in the material handling field.



The OHIO
IS CON-
STRUCTED
OF
90% BASIC
OPEN
HEARTH
STEEL
CASTINGS.
CAPACITIES

15 TO 40
TONS

THE OHIO LOCOMOTIVE CRANE CO.

ELM ST., BUCYRUS, OHIO

CHICAGO OFFICE, RAILWAY EXCHANGE BLDG.

NEW YORK, 30 CHURCH ST.

BROWNING

LOCOMOTIVE CRANES AND BUCKETS



The Browning Crane Company
16226 Waterloo Rd., Cleveland, O.

Domestic



Portable Air Compressors

The above illustrated DOMESTIC Portable Air Compressor is furnishing air for drilling in the quarry of J. B. Burkhart, Chambersburg, Pa., for getting out stone for state road construction.

The "Domestic" is an ideal portable air plant for any quarry. Let us send you Bulletin "A P" giving full particulars of the several sizes we manufacture.

Domestic Engine & Pump Co.
Manufacturers
SHIPPENSBURG, PENNA.



FOR
DRAG LINES
POWER SHOVELS
DERRICKS

AMERICAN
STEEL & WIRE
COMPANY

Chicago

New York

SPEARWELL MOGUL LOADER

A Strictly One Man Machine

CAPACITY $1\frac{1}{2}$ to $2\frac{1}{2}$ CU. YDS. PER MINUTE

Weight 14,000 lbs.

Equipped with positive and efficient excavating, feeding and cleanup device.

Clears path 8 feet wide.

Guaranteed to excavate harder material and to clean up better than any loader of its kind on the market, bar none.

40 H.P. 4 cyl. Heavy Duty Buda Motor.

Positive self-cleaning track. 1500 square inches of bearing surface, less than 10 lbs. load per square inch.

Digging and crowding speeds 4 and 20 ft. per minute. Traveling speeds $\frac{1}{2}$ to $2\frac{1}{2}$ miles per hour.

Digging position quickly and easily adjusted and absolutely maintained by special grade control shoe.

Swivel chute controlled from operator's platform, permits loading in any position.

Write for literature and prices on Spearwell Loaders—a size for every need.



SPEARS-WELLS MACHINERY CO.

Manufacturers of SPEARWELL CONSTRUCTION AND MAINTENANCE EQUIPMENT
Oakland, California

Perforated Metal Screens FOR STONE, SAND, GRAVEL, ETC.



Plates flat; rolled to diameter or radius for revolving and conical screens butted or lap joints.

Elevator Buckets
in all styles and sizes

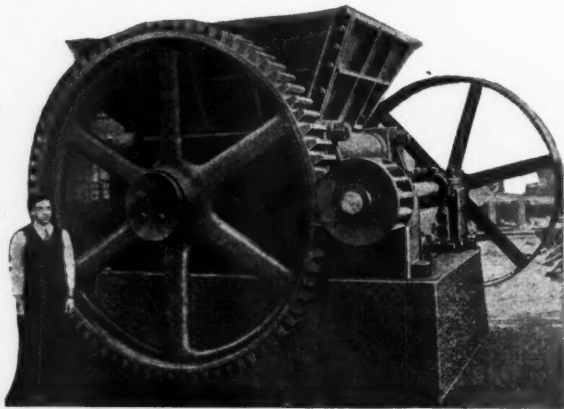
HENDRICK MFG. CO.,

30 Church St., New York City

39 Dundaff Street
CARBONDALE, PA.

954 Union Trust Bldg., Pittsburgh, Pa.

THE IDEAL SINGLE ROLL CRUSHER



WE ALSO MANUFACTURE COMPLETE CRUSHING
PLANT EQUIPMENT

McLANAHAN-STONE MACHINE CO.
HOLLIDAYSBURG, PA.



Quarry face 1,600 feet long and 50 feet high being broken up by means of explosives detonated with Cordeau-Bickford

For one or for two hundred drill holes, use the safe, sure, and efficient detonating agent, Cordeau-Bickford. Even though you have no power line, you can still shoot any number of holes you desire by using Cordeau-Bickford. Write for booklet today.

The Ensign-Bickford Company

Original Manufacturers of Safety Fuse

Established 1836

SIMSBURY, CONNECTICUT

TRADE **ROL-MAN** MARK**WOVEN MANGANESE STEEL SCREENS****Highest Efficiency—Greatest Economy—Longest Life**

Note Face of Screen is flat

Both rods
crimped pre-
venting dis-
placement.

Enlarged section through centre of mesh.

Note closed
double locked
mesh.

The Crimping is all on one side of screen. Makes wearing side smooth and flat. Will handle 50 to 100% more material than perforated plate.

Made in all shapes and sizes—Flat, Rolled to Circles or Cones.
To Fit ANY Revolving, Shaking or Vibrating Screen.

Manganese Steel Forge Co.Richmond & Erie Ave.,
PHILADELPHIA, PA.

Manufacturers of "ROL-MAN" Rolled and Forged Manganese Products

**The Armstrong System
of Blast Hole Drilling**

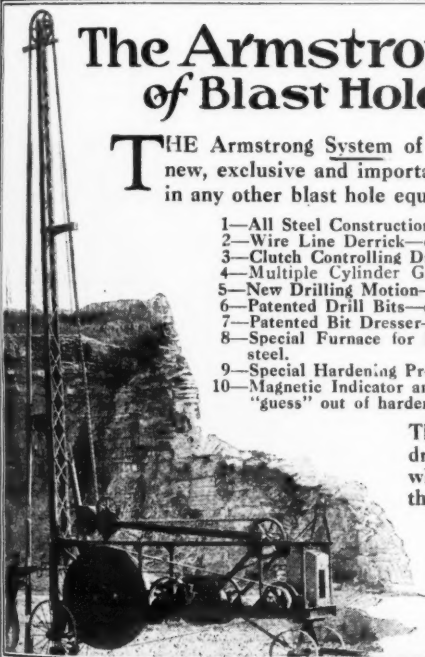
THE Armstrong System of Blast Hole Drilling embodies ten new, exclusive and important features which cannot be found in any other blast hole equipment!

- 1—All Steel Construction—unbreakable, fireproof.
- 2—Wire Line Derrick—cuts cable costs 75%.
- 3—Clutch Controlling Drilling Motion—guaranteed for life.
- 4—Multiple Cylinder Gas Engine—Dependable power plus.
- 5—New Drilling Motion—more blows per minute.
- 6—Patented Drill Bits—cut faster, eliminate fishing jobs.
- 7—Patented Bit Dresser—easily operated by unskilled labor.
- 8—Special Furnace for Drill Bits—heats properly, improves the steel.
- 9—Special Hardening Process—increases life of drill bits.
- 10—Magnetic Indicator and Improved Chemical Solution—take the "guess" out of hardening bits.

This improved method reduces your drilling costs and explains the reason why the big operators are installing the Armstrong System.

Let us tell you more about it.
Full details, specifications and
proof of performance sent free.
Write us NOW—today—sure.

Armstrong Manufacturing Co.
103 Chestnut St. Waterloo, Iowa

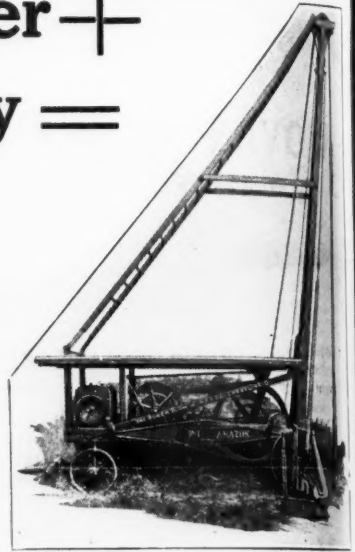


Speed — Power — Boring Ability = Efficiency

The Amazon Drill has the powerful speedy stroke that is so essential to drilling efficiency. Easy of operation, durable and economical, the Amazon Drill is ideal for any operator.

The Amazon is a friction control machine, simple in construction and will drill to a depth of 300 feet.

Write for Drilling Bulletin.

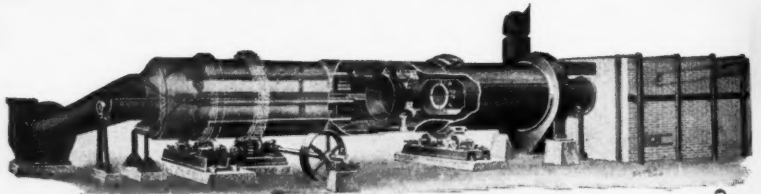


THE BURCH PLOW WORKS CO.
CRESTLINE, OHIO

BUCKEYE DRYERS

FOR

SAND — ROCK — COAL — CLAY



Buckeye Type B Dryer
Patented

The patented inner tube is responsible for the unvarying success of Buckeye Type B Dryers.

DIRECT-INDIRECT FIRED USING COAL, COKE OR OIL
RUGGED CONSTRUCTION—HEAVY DUTY SERVICE

ALSO

BUCKEYE "SPECIAL" DRYERS

Semi-portable—Self-contained—Oil-fired—Direct Motor Drive. We ship the **SPECIAL** dryer assembled complete; set it on two concrete piers and it's ready to operate.

THE BUCKEYE DRYER COMPANY

1351 Railway Exchange Bldg.

Chicago, Ill.

The PERFECT CLASSIFIER

On Dredge Work



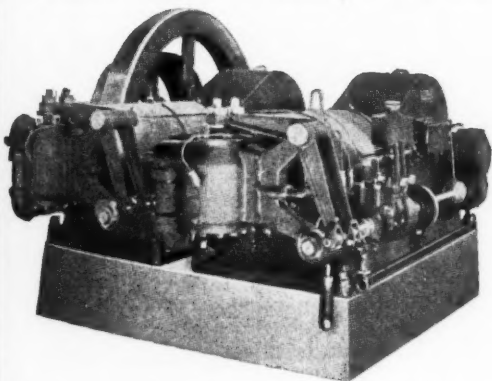
A necessary operation such as washing sand and gravel after dredging it, is made more feasible by a machine like the Perfect Classifier, which handles high tonnage in limited space.

The up-to-date dredge is equipped with a Twin Perfect Classifier,— 36" or 48". The accompanying illustration shows the installation on the T. L. Herbert Sons Co. dredge at Nashville, Tenn.

PERFECT CLASSIFIER CO.
105 First Ave., South
Nashville, Tenn.

We will be pleased to send full information upon request

McEwen Semi-Diesel Engines



*Operate
Without
Water
Injection*

Sometimes, when hard water is used, the pistons and cylinder walls of an engine have been ruined in a short space of time,

due to corrosive action of salts in the water used. McEwen principle of operation eliminates this damage.

Write for descriptive bulletin

McEWEN BROTHERS

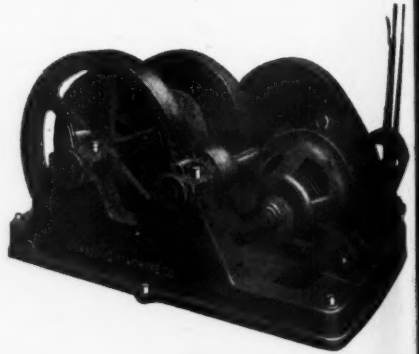
WELLSVILLE, N. Y.

General Purpose Hoists

*Efficient and
Reliable*

DIAMOND Electric Hoists

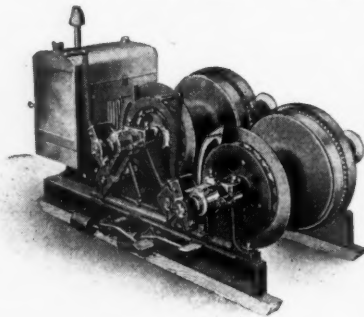
*In Sizes Up to
300 Horse Power*



DIAMOND MACHINE COMPANY
MONONGAHELA, PA.

COOKE-WILSON ELECTRIC SUPPLY CO., SELLING AGENTS
Pittsburgh, Pa. Charleston, W. Va.

"O. & S." Gasoline Hoists



We build a Standard Line of Gasoline Hoists which are noted for their Reliability and Strength. They are built with Single, Double or Triple Drums and with or without Boom Swinging Attachment. These Hoists are built in six sizes, with a capacity of 425 to 5000 pounds on a single line.

Write for Bulletins Nos. 262, 269 and 270.

ORR & SEMBOWER, Inc.
READING, PENNA.

Established 1885

50 Church St.
NEW YORK CITY

208 N. Clinton St.
CHICAGO, ILLINOIS

LIDGERWOOD HOISTS

Electric—Steam—Gasoline



SCRAPERS DRAG LINE

Small electric outfit used by the Luzerne Cement Products Co., at West Nanticoke, Pa.

The outfit shown is an efficient low priced rig for operating on medium size pits, giving a big output for its size, at extremely low cost.

LIDGERWOOD MFG. CO., 96 Liberty St., New York

Chicago; Pittsburgh; Philadelphia; Detroit; Los Angeles; Seattle; Tacoma; Portland, Ore.; Brown-Marr Bldg., Birmingham, Ala. Sales Agents: Norman B. Livermore, San Francisco; Woodward, Wight & Co., New Orleans, La.; John D. Westbrook, Inc., Norfolk Va.; Cameron & Barkley Co., Jacksonville, Miami, Tampa, Fla.; Riechman-Crosby Co., Memphis, Tenn. Canadian Allis-Chalmers, Ltd., Toronto. Foreign Offices: Sao Paulo, Brazil; Rio de Janeiro, Brazil; London, Eng.

TWIN CITY ENGINES



Northwest crane equipped with a TWIN CITY ENGINE at work on a Western Water project.

Other Twin City users include: Austin Machinery Corp., Baldwin Locomotive Works, Buckeye Traction Ditcher Co., Bucyrus Co., The Parsons Co., Washington Iron Works, The Harnischfeger Corp., Inland Engineering Co., Pennsylvania Pump & Compressor Co., Star Drilling Machine Co., Willamette Iron & Steel Works, Etc.

Specify Twin City Engines on your equipment. Sizes 35 to 140 H. P. Write for literature.

MINNEAPOLIS STEEL & MACHINERY CO., Minneapolis, Minn.

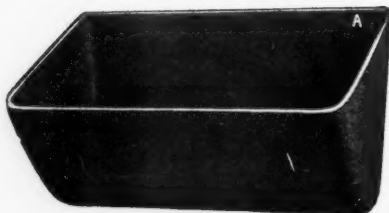
Heavy Duty Engine Manufacturers Since 1903

"BUILT TO DO THE WORK"

B-U-C-K-E-T-S

A complete line of buckets to suit all conditions.

Large stocks on hand.



Each representing the best in design, workmanship and material quality.

For Elevating and Conveying

H. W. CALDWELL & SON CO.

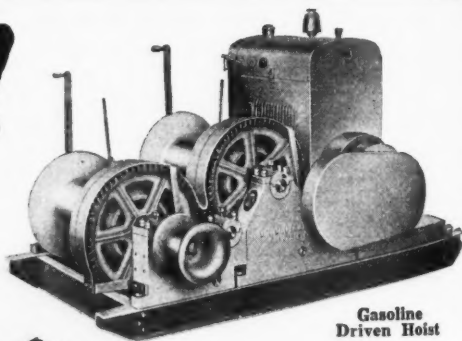
LINK-BELT COMPANY, OWNER

Chicago, 1700 S. Western Ave.; New York, 2676 Woolworth Bldg.; Dallas, 810 Main St.

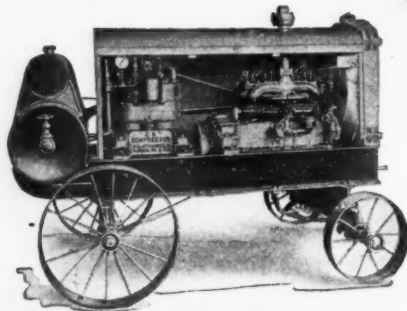
CALDWELL

Economizing Power!

Friction is the constant enemy of power—always eating into power and reducing efficiency.



Gasolene Driven Hoist



Portable Air Compressor

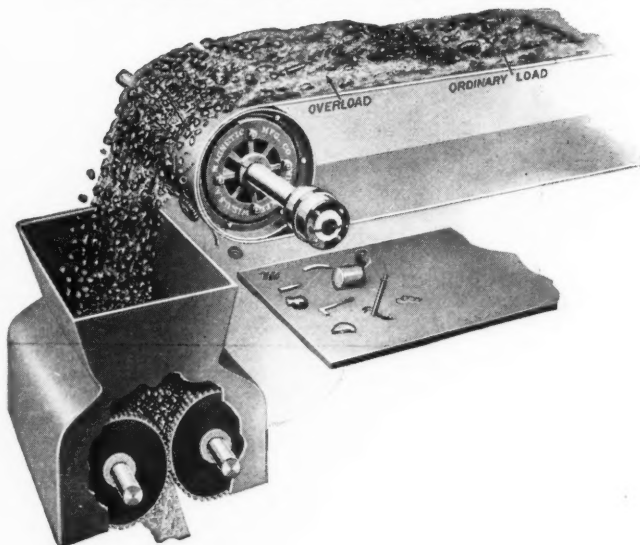
Correctly designed and proportioned bearing surface reduces friction to a minimum, thereby preventing lost power and saving what is developed for actual operation.

O. K. Clutch & Machinery Co.
BOX 305, COLUMBIA, PA.

Sure Protection

against

TRAMP IRON



182 TONS OF DYNAMITE

SENDS 2,000,000 TONS OF ROCK OVER "HIGH DUTY" MAGNETIC PULLEY which removed over three and one-half tons of Tramp Iron from the mass, not a single piece of this iron entered the crushers.

100% protection is effected only when the "HIGH DUTY" is on the job. Bulletin and complete information on request.

MAGNETIC MANUFACTURING CO.

201 24th Ave.

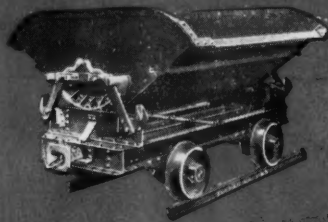
Milwaukee, Wis.

H I G H D U T Y
Magnetic Separators

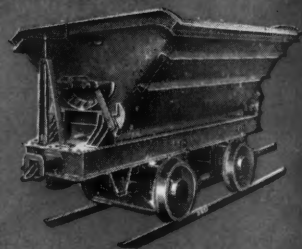
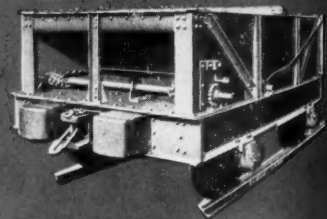
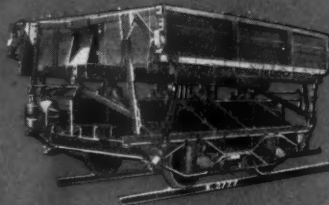
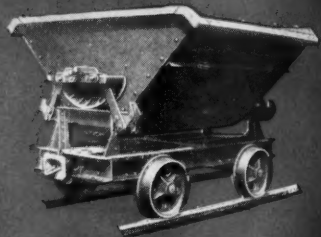
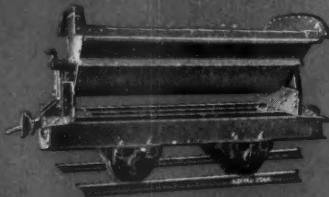


ALL GOOD CARS

KOPPEL



KOPPEL



KOPPEL INDUSTRIAL CAR & EQUIPMENT CO.,

KOPPEL, PENNA.

NEW YORK

PITTSBURGH

CHICAGO

SAN FRANCISCO

ALL GOOD CARS